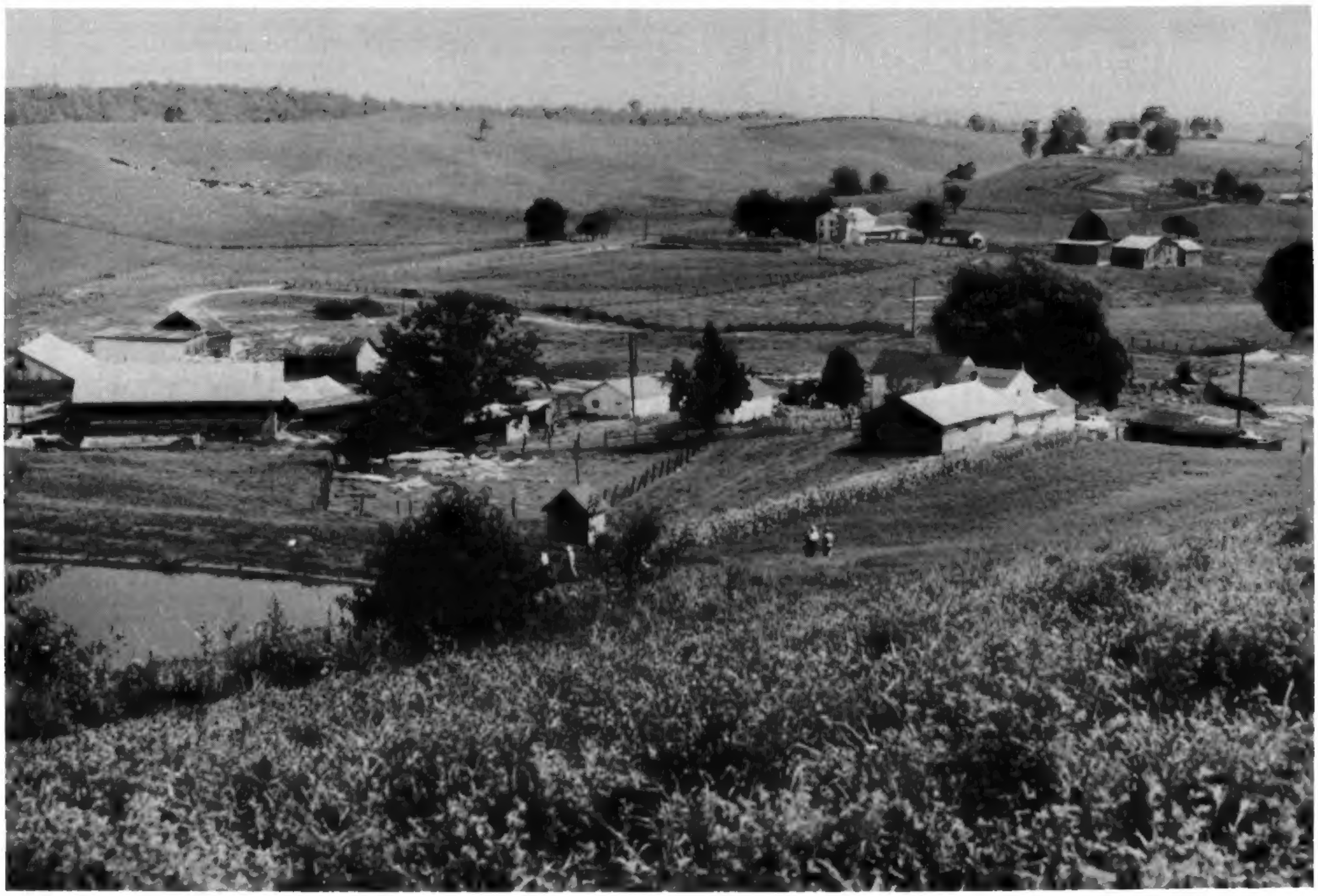
SOIL SURVEY OF

Fayette and Raleigh Counties, West Virginia



United States Department of Agriculture
Soil Conservation Service
In cooperation with
West Virginia University Agricultural Experiment Station

Major fieldwork for this soil survey was done in the period 1961–66. Soil names and descriptions were approved in 1969. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service and the West Virginia University Agricultural Experiment Station. It is part of the technical assistance furnished to the Southern Soil Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Fayette and Raleigh Counties are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil boundaries are outlined and are identified by a symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the two counties in alphabetic order by map symbol. It shows the page where each kind of soil is described and also lists the capability units. Those desiring more detailed information on the soils in the capability units should refer to the section "Descriptions of the Soils."

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions.

Foresters and others can refer to the section "Use of the Soils for Woodland," where the suitability and management of the soils for trees are discussed.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Use of the Soils for Town and Country Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation, Morphology, and Classification of the Soils."

Newcomers in Fayette and Raleigh Counties may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the Area."

Cover: **Typical landscape of Dekalb-Gilpin-Ernest association. Dekalb soils are in the immediate foreground and center. Gilpin soils are on the sloping pasture land in the background.**

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SOIL SURVEY OF FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA

BY JOHN L. GORMAN AND LESTER E. ESPY, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION

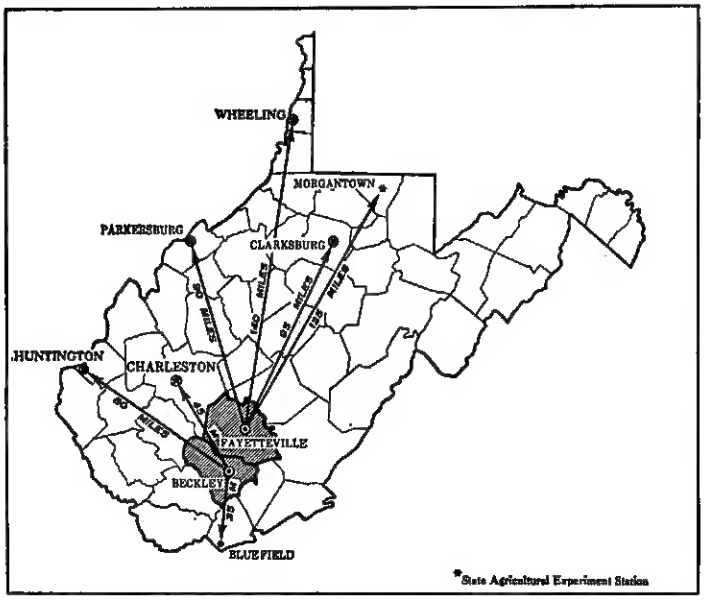

***Figure 1.*—Location of Fayette and Raleigh Counties in West Virginia.**

FAYETTE AND RALEIGH COUNTIES are in the south-central part of West Virginia (fig. 1). They are bounded by seven West Virginia counties, including Mercer County on the south and Nicholas County on the north. The New River flows through the survey area from southeast to northwest; about one-quarter of the area is north and east of the river. The survey area has a total of 808,320 acres, or 1,263 square miles, of which 6,600 acres is water and 13,500 acres is urban areas. Almost the entire area is mountainous, but the eastern three-fifths has broad, gentle ridges amid the rougher land. The western two-fifths is almost entirely mountainous and is deeply dissected by many small streams.

Beckley is the county seat of Raleigh County and is the largest city in the survey area. Fayetteville is the county seat of Fayette County. Many small mining and trading towns are throughout the survey area.

This is an outstanding coal- and timber-producing area. In 1966 the two counties produced nearly 14½ million tons of bituminous coal, or 10 percent of the total output of West Virginia for that year. Slightly more than four-fifths of the area is wooded. Large quantities of hardwood timber are harvested for use in the mining industry, for sawlogs, and for other uses.

Only about 13.5 percent of the land is in farms. Most farms are of the general type. Dairying and the raising of beef cattle and sheep are carried on to a small extent. Corn, oats, and mixed hay are grown for livestock feed. The area has plenty of rain during the growing season. The growing season is favorable, but it is only moderately long, averaging about 140 days. Summers are moderately warm. Winters are moderately cold and have short, very cold periods.

The two counties are served by many roads. The roads include Interstate Highways No. 64 and No. 77 and other through highways. The railroads are the Chesapeake and Ohio, the Norfolk and Western, and the Penn-Central. In addition to coal and lumber operations, electrical components and mining machinery are produced at Beckley, and metallurgical products are developed at Alloy.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Fayette and Raleigh Counties, where they are located, and how they can be used. The soil scientists went into the counties knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are

similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Gilpin and Dekalb, for example, are the names of two soil series. All the soils in the United States that have the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Gilpin silt loam, 3 to 10 percent slopes, is one of several phases within the Gilpin series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of the two counties: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Calvin-Gilpin silt loams, 10 to 20 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Dekalb and Gilpin very stony soils, 5 to 20 percent slopes, is an undifferentiated soil group in this survey area.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Steep rock land and Gravelly alluvial land are land types in the two counties.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fails on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil, and they relate this to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Fayette and Raleigh Counties. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in the survey area, who want to compare different parts of the survey area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Fayette and Raleigh Counties are discussed in the following pages. The texture terms

"medium," "moderately fine," and "moderately coarse" used in the descriptive titles of the soil associations apply to the surface layer.

Soil association names and delineations on the general soil map do not fully agree with those on the general soil map of adjacent counties published at a different date. Differences in the maps are the result of improvement in the classification of soils, particularly modifications or refinements in soil series concepts. In addition, more precise and detailed maps are needed because the number of users of the maps and the need for detail have increased in recent years. The more modern maps meet these needs. Still another difference is the pattern of occurrence of the major soils or the range in slope that is permitted within associations in different surveys.

1. Calvin-Gilpin Association

Moderately deep, well-drained, medium-textured, mostly sloping to very steep soils on dissected uplands and mountains

This association consists of mostly sloping to steep soils on dissected uplands and very steep soils on lower mountainsides. The association is in the eastern parts of Fayette and Raleigh Counties, mostly along the New River.

This association makes up about 4 percent of the survey area. About 40 percent of this is Calvin soils, and 40 percent is Gilpin soils. The remaining 20 percent is minor soils. The Calvin and Gilpin soils in this association are generally intermingled on the landscape.

Calvin soils are moderately deep and well drained. They are mostly very steep and very stony. They have a medium-textured surface layer and a reddish-brown, medium-textured or moderately fine textured subsoil that is channery or very channery. Calvin soils formed in acid material weathered from red shale, siltstone, and some sandstone.

Gilpin soils are moderately deep and well drained. They are mostly very steep and very stony. They have a medium-textured surface layer and a yellowish-brown or strong-brown, moderately fine textured or medium-textured subsoil that is generally channery. Gilpin soils formed in acid material weathered from siltstone, shale, and soft sandstone. They contain less channery fragments than Calvin soils.

Minor soils of this association are the Dekalb soils on uplands, the Ernest and Meckesville soils on foot slopes, and the Atkins, Landes, Philo, and Pope soils on flood plains.

The less sloping, nonstony soils of this association are suited to the most commonly grown crops, such as corn, oats, hay, and pasture grasses. Farming is mostly of the general type. The hazard of erosion and the steep slopes are management concerns. Many pastures are on severely eroded soils. The extensive areas of very stony, very steep soils are mostly wooded. Slopes, stoniness, and bedrock near the surface are limitations for some recreational and community uses.

Soil association 1 on the Fayette and Raleigh Counties general soil map is not identical in name to soil association 3 on the Greenbrier County general soil map. The reason for this is that in Fayette and Raleigh Counties areas of Teas and Litz soils were not correlated.

2. Dekalb-Gilpin-Ernest Association

Moderately deep, well-drained, moderately coarse textured and medium-textured, mostly sloping to very steep soils on dissected uplands and deep, moderately well drained, mostly sloping or steep soils on foot slopes

This association consists of gently sloping to moderately steep soils on ridgetops and flats and steep or very steep soils on sides of ridges (fig. 2). The association is in the dissected Allegheny Plateau area that covers the central and eastern parts of the survey area.

This association makes up about 52 percent of the survey area. About 35 percent of this is Dekalb soils, 35 percent is Gilpin soils, and 5 percent is Ernest soils. The remaining 25 percent is minor soils. The Dekalb and Gilpin soils in this association are generally closely intermingled on the landscape.

Dekalb soils are moderately deep and well drained. They are gently sloping to very steep, and in most places are very steep and very stony. They generally have moderately coarse textured material throughout the profile. Their subsoil is yellowish brown or strong brown, and it is channery or very channery. Dekalb soils formed in material weathered from acid sandstone.

Gilpin soils are moderately deep and well drained. They have a medium-textured surface layer and a yellowish-brown or strong-brown, moderately fine textured or medium-textured subsoil that is generally channery. These soils formed in material weathered from acid siltstone, shale, and soft sandstone. They have a finer textured subsoil and contain fewer channery fragments than Dekalb soils.

Ernest soils are on foot slopes and are deep and moderately well drained. They have a firm layer in the subsoil through which water and air move moderately slowly. Their surface layer is medium textured. Their subsoil is light yellowish brown, yellowish brown, or strong brown and is mottled. It is medium textured or moderately fine textured and is channery in places. Ernest soils formed in material that moved downslope from the uplands.

Minor soils of this association are the Clymer, Cookport, Rayne, and Wharton soils on ridgetops and benches; the Brinkerton, Lickdale, and Shelocta soils on foot slopes; and the Atkins, Chavies, Philo, and Slope soils on flood plains. Coal is strip mined in some areas of the steeper soils.

The less sloping soils of this association are suited to crops, hay, and pasture. Farming is mostly of the general type. The steeper soils are mostly very stony and wooded. Actually, about 75 percent of this association is wooded, and the soils are generally well suited to hardwoods. Much coal is mined, and the many small mining towns are well served by roads and railroads. Beckley, the county seat of Raleigh County, and Fayetteville, the county seat of Fayette County, are in this association. Slopes, stoniness, and bedrock near the surface are limitations for some recreational and community uses.

Soil association 2 on the Fayette and Raleigh Counties general soil map is not identical in name to soil associa-

Figure 2.—**Typical landscape of soil association 2. Dekalb and Gilpin very stony soils are in the steep and very steep background; Ernest silt loams are on foot slopes and at heads of streams; Gilpin silt loams are on the rolling and hilly uplands in foreground and middle distance.**

tion 2 on the Greenbrier County general soil map. The reason for this is that in Fayette and Raleigh Counties, areas of Cookport soils are only a minor part of the association as compared to Ernest soils, but in Greenbrier County they make up a major part of the soil association.

3. Muskingum-Shelocta Association

Moderately deep, well-drained, medium-textured, mostly very steep soils on strongly dissected uplands and deep, well-drained, sloping to steep soils on foot slopes

This association consists of very steep soils in the strongly dissected area of the Cumberland Mountains in the western part of the two counties. The mountains consist of very narrow ridgetops and mostly very steep sides and are dissected by many small streams that generally extend most of the way up the slopes.

This association makes up about 40 percent of the survey area. About 75 percent of this is Muskingum soils, and 5 percent is Shelocta soils. The remaining 20 percent is minor soils.

Muskingum soils are moderately deep and well drained. They are sloping to very steep, and in most places are very steep and very stony. They have medium-textured material throughout the profile. The subsoil is yellowish brown or strong brown, and it is generally channery. Muskingum soils formed in acid material weathered from siltstone, shale, and some sandstone.

Shelocta soils are on foot slopes and are deep and well drained. They have a medium-textured surface layer and a brown, strong-brown, or yellowish-brown, moderately fine textured or medium-textured subsoil that is generally channery. Shelocta soils formed in material that moved downslope from the uplands. The very stony Shelocta soils are mapped with the very stony Ernest soils in the survey area.

Minor soils in this association are the Dekalb, Gilpin, Rayne, and Wharton soils on uplands; the Ernest, Brinkerton, and Lickdale soils on foot slopes; and the Atkins, Chavies, Philo, and Pope soils on flood plains. Coal is strip mined on some of the steeper soils.

The use of the soils in this association is very severely limited by steep slopes. The narrow foot-slope and flood-plain areas are suitable for gardens and small general farms. More than 90 percent of this association is wooded, and the soils are generally well suited to hardwoods. The association is a very important coal-producing area. The many small mining towns are well served by roads and

railroads, most of which follow the major water courses. Slopes, stoniness, and bedrock near the surface are limitations for some recreational and community uses.

4. Steep Rock Land-Dekalb-Gilpin Association

Rough broken sandstone cliffs and rock outcrop areas on uplands and moderately deep, well-drained, moderately coarse textured and medium-textured, very steep soils on uplands

This association consists of soils in the New River Gorge area and extends from the eastern edge of Raleigh County to near Gauley Bridge in the northern part of Fayette County. The New River has cut through sandstone, siltstone, and shale strata and has formed a gorge that has very steep sides, and it ranges from 500 feet in depth at the lower end to nearly 1,000 feet in a few places. Vertical sandstone cliffs 20 to 25 feet high are common, and large stones have accumulated at the base of the cliffs.

This association makes up about 3 percent of the survey area. About 65 percent of this is Steep rock land, 10 percent is Dekalb soils, and 10 percent is Gilpin soils. The remaining 15 percent is minor soils.

Steep rock land consists of the sandstone cliffs and the accumulation of large stones at their base.

Dekalb soils are mostly very steep and very stony. They generally have moderately coarse textured material throughout the profile. Their subsoil is yellowish brown or strong brown, and it is channery or very channery. Dekalb soils formed in material weathered from acid sandstone.

Gilpin soils are mostly very steep and very stony. They have a medium-textured surface layer and a yellowish-brown or strong-brown, moderately fine textured or medium-textured subsoil that is generally channery. Gilpin soils formed in acid material weathered from siltstone, shale, and soft sandstone. They have a finer textured subsoil and contain fewer channery fragments than Dekalb soils.

Minor soils of this association are the Calvin and Gilpin very stony soils on lower mountainsides; the Ernest and Meckesville soils on foot slopes; and the Ashton, Chavies, Landes, Philo, and Pope soils on flood plains.

Most of this association is wooded. Some commercial timber has been harvested, but harvesting is extremely difficult because of the rock cliffs and very steep slopes. Accessible areas are attractive to sightseers and to bird and plant observers. The Chesapeake and Ohio Railroad runs along the New River. Slope, stoniness, rockiness, and bedrock near the surface are limitations for some recreational and community uses.

5. Atkins-Lickdale-Brinkerton Association

Deep, poorly drained, medium-textured, newly level soils on flood plains and deep, poorly drained and very poorly drained, nearly level to gently sloping soils on foot slopes

This association consists of irregularly shaped areas of nearly level soils on flood plains and nearly level or gently sloping soils on foot slopes and at the heads of streams in the Glen Daniel and Ghent sections of Raleigh County.

This association makes up about 1 percent of the survey area. About 50 percent of this is Atkins soils, 25 percent is Lickdale soils, and 15 percent is Brinkerton soils. The remaining 10 percent is minor soils.

Atkins soils are on the flood plains. They are deep, poorly drained, and have a seasonal high water table. Their surface layer is medium textured. Their subsoil is gray, mottled, and medium-textured or moderately fine textured. Atkins soils formed in material washed from the uplands.

Lickdale soils are around the heads of streams or in glades. They are deep and very poorly drained. They have a seasonal high water table and are subject to local ponding. Their surface layer is medium textured. Their subsoil is medium textured or moderately fine textured. Lickdale soils formed in acid colluvium from soils on uplands that are underlain by shale, siltstone, and sandstone.

Brinkerton soils are on foot slopes. They are deep, poorly drained soils that have a firm layer in the subsoil through which water and air move slowly. They also have a seasonal high water table. Their surface layer is medium textured. Their subsoil is light brownish gray, gray, or grayish brown; mottled; and moderately fine textured. Brinkerton soils formed in material that moved downslope from the uplands.

Minor soils of this association are the Gilpin and Dekalb soils on uplands, the Monongahela soils on stream terraces, and the Philo and Pope soils on flood plains.

The soils of this association are severely limited by wetness. They can be improved by artificial drainage, but some areas do not have suitable outlets. Most areas are used for pasture, hay, or trees. Wetness is a severe limitation for some recreational and community uses.

Descriptions of the Soils

This section describes the soil series and mapping units in Fayette and Raleigh Counties. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative of mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, the differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for

moist soil unless otherwise stated. Reaction terms are for unlimed soils.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Strip mine spoil and Made land, for example, do not belong to soil series but, nevertheless, are listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit in which the mapping unit has been placed. The page on which each capability unit is briefly described can be learned by referring to the "Guide to Mapping Units" at the back of this survey. Management by capability units is not given in this soil survey. Statements on soil suitability and management are in the descriptions of the soils and land types in this section.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soils mapping can be obtained from the Soil Survey Manual (*14*).[1]

[1] Italic numbers in parentheses refer to Literature Cited, p. 73.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Fayette County		Raleigh County		Total	
	Acres	Percent	Acres	Percent	Acres	Percent
Alluvial land	490	0.1	1,140	0.4	1,630	0.2
Ashton fine sandy loam	660	.2	70	(1)	730	.1
Atkins silt loam	1,500	.4	4,130	1.1	5,630	.7
Brinkerton silt loam	530	.1	1,440	.4	1,970	.2
Calvin-Gilpin silt loams, 10 to 20 percent slopes	560	.1	370	.1	930	.1
Calvin-Gilpin silt loams, 20 to 30 percent slopes	290	.1	100	(1)	390	(1)
Calvin-Gilpin silt loams, 20 to 30 percent slopes, severely eroded	260	.1	220	.1	480	.1
Calvin-Gilpin silt loams, 30 to 40 percent slopes	490	.1	170	(1)	660	.1
Calvin-Gilpin silt loams, 30 to 40 percent slopes, severely eroded	450	.1	550	.1	1,000	.1
Calvin-Gilpin silt loams, 40 to 70 percent slopes	1,010	.2	370	.1	1,380	.2
Calvin-Gilpin silt loams, 40 to 70 percent slopes, severely eroded	-------	-------	1,270	.3	1,270	.2
Calvin-Gilpin very stony silt loams, 10 to 20 percent slopes	90	(1)	200	.1	290	(1)
Calvin-Gilpin very stony silt loams, 20 to 40 percent slopes	1,090	.3	830	.2	1,920	.2
Calvin-Gilpin very stony silt loams, 40 to 70 percent slopes	5,750	1.4	9,480	2.5	15,230	1.9
Chavies fine sandy loam	1,030	.2	630	.2	1,660	.2
Clymer loam, 3 to 10 percent slopes	1,300	.3	1,540	.4	2,840	.3
Clymer loam, 10 to 20 percent slopes	290	.1	1,600	.4	1,890	.2
Cookport loam, 2 to 8 percent slopes	1,600	.4	1,200	.3	2,800	.3
Dekalb fine sandy loam, 3 to 10 percent slopes	5,460	1.3	5,040	1.3	10,500	1.3
Dekalb fine sandy loam, 10 to 20 percent slopes	29,500	7.0	12,860	3.3	42,360	5.3
Dekalb channery loam, 20 to 30 percent slopes	8,330	2.0	4,430	1.1	12,760	1.6
Dekalb channery loam, 30 to 40 percent slopes	7,540	1.7	2,720	.7	10,260	1.3
Dekalb and Gilpin very stony soils, 5 to 20 percent slopes	7,850	1.8	3,190	.8	11,040	1.4
Dekalb and Gilpin very stony soils, 20 to 40 percent slopes	30,080	7.1	16,040	4.1	46,120	5.8
Dekalb and Gilpin very stony soils, 40 to 70 percent slopes	59,260	14.0	38,470	10.0	97,730	12.1
Ernest silt loam, 3 to 10 percent slopes	5,420	1.3	5,330	1.4	10,750	1.3
Ernest silt loam, 10 to 20 percent slopes	1,100	.3	910	.2	2,010	.2
Ernest and Shelocta very stony silt loams, 5 to 20 percent slopes	5,730	1.3	5,280	1.4	11,010	1.4
Ernest and Shelocta very stony silt loams, 20 to 40 percent slopes	4,790	1.1	3,730	1.0	8,520	1.1
Gilpin silt loam, 3 to 10 percent slopes	1,140	.3	1,590	.4	2,730	.3
Gilpin silt loam, 10 to 20 percent slopes	17,870	4.2	13,720	3.5	31,590	4.0
Gilpin silt loam, 10 to 20 percent slopes, severely eroded	790	.2	1,100	.3	1,890	.2
Gilpin silt loam, 20 to 30 percent slopes	10,120	2.4	9,220	2.4	19,340	2.4
Gilpin silt loam, 20 to 30 percent slopes, severely eroded	1,830	.4	3,170	.8	5,000	.6
Gilpin silt loam, 30 to 40 percent slopes	10,830	2.6	1,410	.4	12,240	1.5
Gilpin silt loam, 30 to 40 percent slopes, severely eroded	420	.1	1,770	.5	2,190	.3
Gilpin silt loam, 40 to 65 percent slopes	19,360	4.6	19,230	5.0	38,590	4.8
Gilpin silt loam, 40 to 65 percent slopes, severely eroded	490	.1	1,850	.5	2,340	.3
Gravelly alluvial land	1,190	.3	1,240	.3	2,430	.3
Landes fine sandy loam	260	.1	120	(1)	380	(1)
Lickdale silt loam	710	.2	1,900	.5	2,610	.3
Made land	1,060	.2	1,680	.4	2,740	.3
Meckesville silt loam, 3 to 10 percent slopes	50	(1)	110	(1)	160	(1)
Meckesville silt loam, 10 to 20 percent slopes	130	(1)	560	.1	690	.1
Meckesville very stony silt loam, 10 to 20 percent slopes	280	.1	450	.1	730	.1
Meckesville very stony silt loam, 20 to 40 percent slopes	730	.2	320	.1	1,050	.1
Mine dump	1,270	.3	1,190	.3	2,460	.3
Monongahela silt loam, 0 to 3 percent slopes	70	(1)	160	(1)	230	(1)
Monongahela silt loam, 3 to 10 percent slopes	290	.1	550	.1	840	.1
Muskingum silt loam, 10 to 20 percent slopes	1,360	.3	5,520	1.4	6,880	.9
Muskingum silt loam, 10 to 20 percent slopes, severely eroded	260	.1	440	.1	700	.1

See footnote at end of table.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Fayette County		Raleigh County		Total	
	Acres	Percent	Acres	Percent	Acres	Percent
Muskingum silt loam, 20 to 30 percent slopes	2,800	.7	4,270	1.1	7,070	.9
Muskingum silt loam, 20 to 30 percent slopes, severely eroded	1,120	.3	1,380	.4	2,500	.3
Muskingum silt loam, 30 to 40 percent slopes	3,090	.7	7,970	2.1	11,060	1.4
Muskingum silt loam, 30 to 40 percent slopes, severely eroded	810	.2	1,200	.3	2,010	.2
Muskingum silt loam, 40 to 75 percent slopes	21,500	5.1	37,490	9.7	58,990	7.3
Muskingum very stony silt loam, 20 to 40 percent slopes	1,140	.3	1,310	.3	2,450	.3
Muskingum very stony silt loam, 40 to 75 percent slopes	90,160	21.4	95,880	24.8	186,040	23.0
Philo silt loam	1,590	.4	2,940	.8	4,530	.6
Pope fine sandy loam	620	.1	990	.3	1,610	.2
Rayne silt loam, 3 to 10 percent slopes	720	.2	2,190	.6	2,910	.4
Rayne silt loam, 10 to 20 percent slopes	720	.2	1,860	.5	2,580	.3
Shelocta silt loam, 10 to 20 percent slopes	2,390	.6	2,260	.6	4,650	.6
Shelocta silt loam, 20 to 30 percent slopes	770	.2	820	.2	1,590	.2
Shelocta silt loam, 30 to 40 percent slopes	1,480	.3	1,830	.5	3,310	.4
Steep rock land	7,600	1.8	10,670	2.8	18,270	2.3
Strip mine spoil	19,520	4.6	11,400	2.9	30,920	3.7
Summers loam, 3 to 10 percent slopes	210	(1)	60	(1)	270	(1)
Wharton silt loam, 3 to 10 percent slopes	1,410	.3	560	.1	1,970	.2
Wharton silt loam, 10 to 20 percent slopes	670	.2	870	.2	1,540	.2
Wharton silt loam, 10 to 20 percent slopes, severely eroded	180	(1)	200	.1	380	(1)
Subtotal	411,460	97.5	376,760	97.5	788,220	97.4
Water	4,500	1.1	2,100	.5	6,600	.9
Urban areas	5,800	1.4	7,700	2.0	13,500	1.7
Totals	421,760	100.0	386,560	100.0	808,320	100.0

[1] Less than 0.05 percent.

Alluvial Land

Alluvial land (Ad) consists of soils that formed in recently deposited material along many small streams in the survey area. Shallow depressions and old stream channels are fairly numerous. This land is flooded annually or more often, and the flooding adds or removes soil material. Texture and drainage vary within short distances. The soil material is mostly medium textured, but in some places, especially near the stream edges, it is coarse textured and gravelly.

This land is excessively drained to poorly drained. Slopes are 0 to 6 percent. Bedrock is generally at a depth of more than 3 feet.

The very severe hazard of flooding and alternating droughtiness and wetness severely limit the use of this land. It is generally better suited to pasture, wooded areas, or wildlife habitat than to other uses. Capability unit VIw-1.

Ashton Series

The Ashton series consists of deep, well-drained soils on high positions of the flood plain along the New and Kanawha Rivers. These soils formed in alluvium washed from soils on uplands that are mostly underlain by limestone. They flood only when floodwaters are at their highest. Slopes range from 0 to 5 percent.

In a representative profile the surface layer is very dark brown fine sandy loam about 10 inches thick. The subsoil, which extends to a depth of 48 inches, is friable and firm, dark-brown coarse silt loam in the upper part, silt loam in the middle, and heavy silt loam in the lower part. Below the subsoil is brown silt loam that contains thin, discontinuous layers of loam or fine sandy loam.

Ashton soils have high available moisture capacity and moderate permeability. Natural fertility is high.

Ashton soils are easy to work and are suited to crops, hay, and pasture.

Representative profile of Ashton fine sandy loam in a garden along New River, near Deep Water, in Fayette County:

Ap—0 to 10 inches, very dark brown (10YR 2/2) fine sandy loam; moderate, fine, granular structure; very friable; many roots; neutral; abrupt, smooth boundary.

B1—10 to 18 inches, dark-brown (7.5YR 4/2) coarse silt loam; weak, fine and medium, subangular blocky structure; friable; neutral; clear, wavy boundary.

B21t—18 to 37 inches, dark-brown (7.5YR 4/4) silt loam; moderate, medium, subangular blocky structure; firm; common, thin clay films; few vertical cracks; slightly acid; gradual, wavy boundary.

B22t—37 to 48 inches, dark-brown (7.5YR 4/4) heavy silt loam; weak, coarse, prismatic structure parting to moderate, coarse, subangular blocky; firm; common, thin, dark yellowish-brown (10YR 4/4) silt films on ped faces; few clay films; slightly acid; gradual, wavy boundary.

C—48 to 60 inches, brown (7.5YR 4/4) silt loam; very weak, coarse, subangular blocky structure; friable to firm; few, thin, discontinuous layers of loam or fine sandy loam; slightly acid.

Depth to bedrock is more than 5 feet. Depth to thin, discontinuous layers of stratified material ranges from 40 to 54 inches. Natural reaction is slightly acid to neutral throughout the profile.

The dark-colored Ap horizon is 8 to 10 inches thick. The B horizon ranges from silt loam to light silty clay loam. It is dark brown to dark yellowish brown.

Ashton soils commonly are next to Landes soils. They are on higher positions of the flood plain, have a less sandy B horizon, and are less frequently flooded than Landes soils.

Ashton fine sandy loam (As).—This is the only Ashton soil mapped in the survey area. Slopes are 0 to 5 percent. Included in mapping were areas of soils that have a surface layer of silt loam, small areas of soils that are moderately well drained, and areas of soils that have a slightly thicker, dark-colored surface layer. Also included were a few short, steeply sloping banks.

This soil is suited to all crops commonly grown in the two counties. Continuous row crops can be grown, but need the protection of a cover crop. Working crop residue into the soil improves tilth and fertility. Diversion terraces along the base of adjacent slopes are needed in places to divert surface water from this soil. Capability unit I-6.

Atkins Series

The Atkins series consists of deep, poorly drained soils on flood plains along the smaller streams, mostly in the central and eastern parts of the survey area. These soils formed in acid alluvial material that washed from soils on uplands underlain by sandstone, siltstone, and shale. They are subject to flooding. Some low-lying areas are flooded annually. Slopes range from 0 to 3 percent.

In a representative profile the surface layer is dark-gray silt loam underlain at a depth of 2 inches by gray, mottled silt loam about 8 inches thick. The subsoil, which extends to a depth of 34 inches, is gray mottled with strong brown. It is friable to firm heavy silt loam in the upper part and firm light silty clay loam in the lower part. Below the subsoil is mixed gray and strong-brown heavy silt loam.

Atkins soils have high available water capacity and moderately slow permeability. They have a seasonal high water table. Natural fertility is moderate.

These wet soils, unless artificially drained, are poorly suited to crops, hay, and pasture. Many areas are in pin oaks.

Representative profile of Atkins silt loam in a wooded area west of Fairdale, in Raleigh County:

A1—0 to 2 inches, dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; friable; many fine roots; very strongly acid; clear, wavy boundary.

A2g—2 to 10 inches, gray (10YR 5/1) silt loam; common, medium, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; friable to firm; few dark-gray (10YR 4/1) ped faces; many roots; very strongly acid; clear, wavy boundary.

B21g—10 to 20 inches, gray (10YR 5/1) heavy silt loam; many, medium, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; friable to firm; common roots; very strongly acid; clear, wavy boundary.

B22g—20 to 34 inches, gray (10YR 5/1) light silty clay loam; many strong-brown (7.5YR 5/8) mottles; weak, medium and coarse, subangular blocky structure; firm, slightly plastic and slightly sticky; common fine root channels and roots; very strongly acid; gradual, wavy boundary.

C—34 to 55 inches, mixed gray (10YR 5/1) and strong-brown (7.5YR 5/8) heavy silt loam; massive; firm; few yellowish-red (5YR 5/8) streaks; few fine roots; few black concretions; very strongly acid.

Bedrock is generally at a depth of more than 4 feet. Natural reaction is strongly acid to very strongly acid throughout the profile.

The B horizon ranges from silt loam to silty clay loam. It is gray mottled with strong brown or yellowish brown.

Atkins soils are next to the moderately well drained Philo soils and the well drained Pope soils. They are less well drained than either of those soils.

Atkins silt loam (At).—This is the only Atkins soil mapped in the survey area. It is nearly level. The water table is at or near the surface in winter and early in spring. Surface drainage is poor, and water is sometimes ponded for long periods.

Included with this soil in mapping were areas of soils that have a very dark grayish-brown to black surface layer and a few areas of a soil that has sandy or gravelly layers in the lower part of the subsoil.

Unless artificially drained, this soil has little value for farming, except for some low-producing pasture. It can be artificially drained if suitable outlets are available (fig. 3). Diversion terraces help to divert water from some slopes. In drained areas, corn, hay, pasture, and other crops that tolerate wetness can be grown. In places crops are damaged by flood water. Delaying the pasturing or tilling of this wet soil until it is reasonably dry and firm helps to avoid soil compaction and loss of tilth. Capability unit IIIw-1.

Brinkerton Series

The Brinkerton series consists of deep, poorly drained soils on foot slopes in the central and eastern parts of the survey area. These soils formed in acid colluvial material that moved downslope from soils on uplands that are underlain by shale, siltstone, and sandstone. Slopes range from 0 to 5 percent.

In a representative profile in a pasture field the surface layer is dark grayish-brown silt loam about 8 inches thick. The upper part of the subsoil, about 5 inches thick, is friable, grayish-brown silty clay loam mottled with yellowish brown and light olive brown. The next 12 inches is friable to firm, light brownish-gray silty clay loam mottled with strong brown and yellowish red. The lower part of the subsoil, a fragipan layer, is firm to very firm, mixed light brownish-gray and yellowish-red light silty clay loam that extends to a depth of 47 inches. Below the subsoil is gray silty clay loam.

Brinkerton soils have high available moisture capacity. They have slow permeability in the fragipan and moderately slow permeability above the fragipan. The water table is high in winter and early spring. Natural fertility is moderate.

These wet soils, if not artificially drained, are poorly suited to crops. Water-tolerant grasses and legumes grow well on them.

Representative profile of Brinkerton silt loam in a pasture on the upper part of Oak Creek, about two-thirds of a mile north-northwest of Ghent, in Raleigh County:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; very friable; many roots; very strongly acid; clear, wavy boundary.

B21tg—8 to 13 inches grayish-brown (2.5Y 5/2) silty clay loam; common, fine and medium, yellowish-brown (10YR 5/6) and light olive-brown (2.5Y 5/4) mottles; moderate, medium, subangular blocky structure; friable; many roots; thin, discontinuous clay films; very strongly acid; clear, wavy boundary.

Figure 3.—Atkins silt loam is in the foreground. This soil has been drained, and it supports a good cover of clover and orchardgrass. Ernest soils are in the center, and Dekalb soils are on the steep wooded slopes.

B22tg—13 to 25 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, medium and coarse, strong-brown (7.5YR 5/6) and yellowish-red (5YR 5/6) mottles; moderate, medium, subangular blocky structure; friable to firm; thin, discontinuous clay films; very strongly acid; clear, wavy boundary.

Bxg—25 to 47 inches, mixed light brownish-gray (2.5Y 6/2) and yellowish-red (5YR 5/8) light silty clay loam; weak, medium and coarse, subangular blocky structure; firm to very firm; few reddish-gray (5YR 5/2) ped faces; few manganese concretions; few sandstone fragments; very strongly acid; gradual, wavy boundary.

Cg—47 to 54 inches, gray (10YR 5/1) silty clay loam; massive; friable to firm; few manganese concretions; 10 percent sandstone fragments; strongly acid.

Depth to bedrock is more than 4 feet. Depth to the fragipan ranges from 20 to 26 inches. Reaction is strongly acid to very strongly acid in the solum and is generally strongly acid in the C horizon. The B horizon ranges from silty clay loam to heavy silt loam. It is grayish brown to light brownish gray or gray. This horizon is 0 to 15 percent coarse fragments.

Brinkerton soils are near the moderately well drained Ernest soils and the very poorly drained Lickdale soils. They are better drained than Lickdale soils and less well drained than Ernest soils.

Brinkerton silt loam (Br).—This is the only Brinkerton soil mapped in the survey area. Slopes range from 0 to 5 percent but are mainly more than 2 percent. The water table is near the surface in winter and early spring.

Included with this soil in mapping were small areas of Ernest and Lickdale soils, areas of soils that have large stones in the lower part of the subsoil, and areas of soils that have a very strongly acid C horizon.

This Brinkerton soil is suited to water-tolerant grasses and legumes. If drained, it is suitable to a wider variety of crops. Minimum tillage and delaying pasturing or tilling of this wet soil until it is reasonably dry and firm help avoid soil compaction and loss of tilth. Contour stripcropping helps control erosion on long slopes. Diversion terraces are needed in places to divert runoff coming from hill slopes. Capability unit IVw-5.

Calvin Series

The Calvin series consists of moderately deep, well-drained soils on dissected uplands and steep soils on lower parts of mountainsides along the eastern edge of the survey area. These soils formed in acid material weathered from red shale, siltstone, and some sandstone. They have a very channery subsoil. Slopes range from 10 to 70 percent, but slopes of more than 40 percent are dominant. Both nonstony and very stony units were mapped in the survey area, but the very stony units make up most of the acreage.

In a representative profile the surface layer is reddish-brown silt loam about 6 inches thick. The subsoil, which extends to a depth of 21 inches, is friable, reddish-brown

heavy silt loam in the upper part and very channery heavy silt loam in the lower part. Below the subsoil is friable, reddish-brown very channery silt loam that contains beds of reddish-brown siltstone. Bedrock is at a depth of 24 inches.

Calvin soils have moderate available moisture capacity and moderately rapid permeability. Natural fertility is moderate.

Most areas of Calvin soils are poorly suited to crops, hay, and pasture because they are steep and stony. Areas of the less sloping, nonstony soils are used for crops and pasture. Areas of the steeper soils are in pasture or are wooded. Most areas of the very stony soils are wooded.

In Fayette and Raleigh Counties, Calvin soils occur in a mixed pattern with Gilpin soils and were mapped with them in the survey area.

Representative profile of Calvin silt loam in an area of Calvin-Gilpin silt loams, 30 to 40 percent slopes, in a pasture near the head of Pinch Creek southeast of Pluto, in Raleigh County:

Ap—0 to 6 inches, reddish-brown (5YR 4/3) silt loam; moderate, fine, granular structure; very friable; many roots; very strongly acid; clear, wavy boundary.

B2—6 to 15 inches, reddish-brown (5YR 4/3) heavy silt loam; moderate, medium, subangular blocky structure; friable; common roots; strongly acid; streak of dark reddish gray; 10 percent siltstone fragments; clear, wavy boundary.

B3—15 to 21 inches, reddish-brown (5YR 4/3) very channery heavy silt loam; weak, medium, subangular blocky structure; friable; common roots; 50 percent siltstone fragments; very strongly acid; clear, wavy boundary.

C—21 to 24 inches, reddish-brown (5YR 4/3) very channery silt loam; massive; friable; 80 percent weathered reddish-brown siltstone; very strongly acid; gradual, wavy boundary.

R—24 inches, reddish siltstone.

Depth to bedrock ranges from 20 to 30 inches. Coarse fragments make up more than 35 percent of the material in the profile. Natural reaction is strongly acid to very strongly acid throughout the profile.

The B horizon ranges from silt loam to clay loam and is commonly channery or very channery. It is reddish brown to red. This horizon is 10 to 60 percent coarse fragments. The frequency of occurrence of these fragments increases with depth.

Calvin soils are near the well-drained Gilpin and Dekalb soils. They are redder and have a coarser textured subsoil than Gilpin soils. They are finer textured than Dekalb soils.

Calvin-Gilpin silt loams, 10 to 20 percent slopes (CaC).—The Calvin soil makes up about 50 percent of this mapping unit, and the Gilpin soil about 40 percent. The Calvin soil is deeper over bedrock than the soil described as representative of the Calvin series.

Included with these soils in mapping were small areas of red soils that have a subsoil of silty clay loam, small areas of Dekalb soils, and small areas where stones are on the surface.

These soils are suited to crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas.

In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. A cover of sod should be kept on natural drainageways. Capability unit IIIe–10.

Calvin-Gilpin silt loams, 20 to 30 percent slopes (CaD).—The Calvin soil makes up about 50 percent of this mapping unit, and the Gilpin soil about 40 percent. The Calvin soil is slightly deeper over bedrock than the soil described as representative of the Calvin series. The Gilpin soil is generally shallower over bedrock and contains more stone fragments than the soil described as representative of the Gilpin series.

Included with these soils in mapping were small areas of red soils that have a subsoil of silty clay loam, small areas of Dekalb soils, and small areas where stones are on the the surface.

These soils are suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas.

In cultivated areas, minimum tillage, contour stripcropping, and cropping systems that include hay help to control erosion, maintain the content of organic matter, and maintain good tilth. Diversion terraces on long slopes help to limit soil and water losses. A cover of sod should be kept on natural drainageways. Capability unit IVe–3.

Calvin-Gilpin silt loams, 20 to 30 percent slopes, severely eroded (CaD3).—The Calvin soil makes up about 50 percent of this mapping unit, and the Gilpin soil about 40 percent. The Calvin soil is more eroded and contains more stone fragments than the soil described as representative of the Calvin series. The Gilpin soil also is more eroded, and it is generally shallower and contains more stone fragments than the soil described as representative of the Gilpin series. Erosion has removed most of the original surface layer from these soils. Shallow gullies are fairly common.

Included with these soils in mapping were small areas of red soils that have a subsoil of silty clay loam, small areas of Dekalb soils, and small areas where stones are on the surface.

These soils are somewhat droughty. The erosion hazard is very severe in unprotected areas.

These soils are unsuited to cultivated crops. They are better suited to pasture than to other uses. Good pasture management is needed to control further erosion and to rebuild tilth and fertility. Capability unit VIe–2.

Calvin-Gilpin silt loams, 30 to 40 percent slopes (CaE).—The Calvin soil makes up about 50 percent of this mapping unit, and the Gilpin soil about 40 percent. The Calvin soil has the profile described as representative of the Calvin series. The Gilpin soil is generally shallower and contains more stone fragments than the soil described as representative of the Gilpin series.

Included with these soils in mapping were small areas of Dekalb soils and small areas where flagstones are on the surface.

Steep slopes make these soils unsuited to cultivated crops. They are suited to pasture. Good pasture management is needed to control erosion and maintain fertility. Capability unit VIe–2.

Calvin-Gilpin silt loams, 30 to 40 percent slopes, severely eroded (CaE3).—The Calvin soil makes up about 50 percent of this unit, and the Gilpin soil about 40 percent. These soils are more eroded, contain more stone fragments, and are shallower over bedrock than the soils described as representative of their respective series. Erosion has removed most of the original surface layer from these soils. Shallow gullies are fairly common.

Included with these soils in mapping were small areas of Dekalb soils and small areas where flagstones and larger stones are on the surface.

These soils are unsuited to cultivated crops and hay. It is difficult to establish and maintain pasture on these steeply sloping, severely eroded soils, and they are poorly suited to that use. They are more suitable for growing trees than for other uses. Capability unit VIIe-2.

Calvin-Gilpin silt loams, 40 to 70 percent slopes (CoF).—The Calvin soil makes up about 60 percent of this mapping unit, and the Gilpin soil about 30 percent. The Calvin soil contains slightly more stone fragments than the soil described as representative of the Calvin series. The Gilpin soil is generally shallower over bedrock and contains more stone fragments than the soil described as representative of the Gilpin series.

Included with these soils in mapping were small areas of Dekalb soils and small areas where flagstones and larger stones are on the surface.

These soils are unsuited to cultivated crops and hay and are poorly suited to pasture. Pasture management is difficult on these very steep soils. They are more suitable for growing trees than for other uses. Capability unit VIIe-2.

Calvin-Gilpin silt loams, 40 to 70 percent slopes, severely eroded (CoF3).—The Calvin soil makes up about 60 percent of this mapping unit, and the Gilpin soil about 30 percent. These soils are more eroded, contain more stone fragments, and are generally shallower over bedrock than the soils described as representative of their respective series. Erosion has removed most of the original surface layer from these soils. Shallow gullies are fairly common.

Included with these soils in mapping were small areas of Dekalb soils and small areas where flagstones and larger stones are on the surface.

These soils are unsuited to cultivated crops and hay. It is difficult to establish and maintain pasture on these very steep, severely eroded soils, and they are poorly suited to that use. They are more suitable for growing trees than for other uses. Capability unit VIIe-2.

Calvin-Gilpin very stony silt loams, 10 to 20 percent slopes (CgC).—The Calvin soil makes up about 50 percent of this mapping unit, and the Gilpin soil about 40 percent. The Calvin soil has a very stony surface layer and is deeper over bedrock than the soil described as representative of the Calvin series. The Gilpin soil also has a very stony surface layer, but the profile is very similar to that described as representative of the Gilpin series.

Included with these soils in mapping were small areas of less stony soils and small areas of very stony Dekalb soils.

These very stony soils are unsuited to cultivated crops. They are poorly suited to hay, but bluegrass pasture grows moderately well. Stones moderately restrict use of good management practices. Capability unit VIs-2.

Calvin-Gilpin very stony silt loams, 20 to 40 percent slopes (CgE).—The Calvin soil makes up about 50 percent of this mapping unit, and the Gilpin soil about 35 percent. The Calvin soil is similar to the soil described as representative of the Calvin series, but it has a very stony surface layer. The Gilpin soil has a very stony surface layer and is generally shallower over bedrock than the soil described as representative of the Gilpin series.

Included with these soils in mapping were small areas of less stony soils and small areas of Dekalb soils.

These very stony soils are unsuited to cultivated crops and hay and are very poorly suited to pasture. They are more suitable for growing trees than for other uses. Capability unit VIIs-2.

Calvin-Gilpin very stony silt loams, 40 to 70 percent slopes (CgF).—The Calvin soil makes up about 60 percent of this mapping unit, and the Gilpin soil about 25 percent. The Calvin soil is very stony at the surface and contains more stone fragments than the soil described as representative of the Calvin series. The Gilpin soil is generally shallower over bedrock and contains more stone fragments than the soil described as representative of the Gilpin series.

Included with these soils in mapping were small areas of less stony soils and small areas of very stony Dekalb soils.

These soils are too steep and too stony for cultivated crops, hay, and pasture. They are more suitable for growing trees than for other uses. Capability unit VIIs-2.

Chavies Series

The Chavies series consists of deep, well-drained soils on high positions of the flood plains. These soils are along the larger streams of the survey area. They formed in acid alluvial material washed from soils on uplands that are underlain by sandstone, siltstone, and shale. Chavies soils are slightly droughty and are subject to infrequent overflow. Slopes range from 0 to 5 percent.

In a representative profile the surface layer is brown fine sandy loam about 9 inches thick. The subsoil extends to a depth of 34 inches and is yellowish-brown, friable to very friable fine sandy loam. Below the subsoil is dark yellowish-brown and yellowish-brown stratified sandy loam and loamy sand.

Chavies soils have moderate to high available moisture capacity and moderately rapid permeability. Natural fertility is moderate to high.

These soils are easy to work. They are suited to crops, hay, and pasture. Many areas are used for gardens. Some areas are used for homesites, but onsite investigations should be made and flood records checked before building on these soils.

Representative profile of Chavies fine sandy loam in a pasture on the Lower Clear Fork of Big Coal River, west of Artie, in Raleigh County:

Ap—0 to 9 inches, brown (10YR 4/3) fine sandy loam; weak, medium, granular structure and weak, fine, subangular blocky; very friable; slightly acid; clear, smooth boundary.

B1—9 to 14 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, fine and medium, subangular blocky structure; friable; medium acid; clear, wavy boundary.

B21t—14 to 21 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak to moderate, medium, subangular blocky structure; friable; thin, discontinuous clay films; strongly acid; clear, wavy boundary.

B22t—21 to 34 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, medium and coarse, subangular blocky structure; very friable; thin, discontinuous clay films; strongly acid; gradual, wavy boundary.

C—34 to 50 inches, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/4) stratified sandy loam

and loamy sand; single grain; very friable to loose; strongly acid.

Bedrock is at a depth of more than 4 feet. Depth to stratified material is about 32 to 40 inches. Natural reaction of the soil material throughout the profile is strongly acid to medium acid.

The B horizon ranges from fine sandy loam to loam. It is yellowish brown to strong brown. The C horizon contains gravel in places.

Depth to stratified material is less than currently defined for the Chavies series, but this difference does not alter the usefulness or behavior of the soils.

Chavies soils are next to the well-drained Pope soils and next to Alluvial land. They are on higher positions of the flood plains and are flooded less frequently than either Pope soils or Alluvial land. They have stronger structure and more distinct subsoil horizons than Pope soils.

Chavies fine sandy loam (Ch).—This is the only Chavies soil mapped in the survey area. Slopes range from 0 to 5 percent. Included in mapping were small areas of coarser textured soils that are more droughty than this soil. Also included, particularly along the Coal River and its forks, were areas where the surface layer is dark colored, apparently because of deposition of coal dust. The dark material does not appear to seriously affect the use of this soil for plants.

This soil can be used for all crops commonly grown in the survey area. Continuous row crops can be grown, but they need the protection of a cover crop. Working crop residue into the soil improves tilth, fertility, and available moisture capacity. Capability unit I–6.

Clymer Series

The Clymer series consists of deep, well-drained soils on mountaintops and broad benches in the central and eastern parts of the survey area. These soils formed in acid material weathered from sandstone. They contain some coarse fragments in the subsoil. Slopes are 3 to 20 percent.

In a representative profile the surface layer is dark grayish-brown loam about 8 inches thick. The subsoil extends to a depth of 38 inches. The upper 14 inches is friable, yellowish-brown fine sandy loam. The next 10 inches is friable to firm, strong-brown and yellowish-brown light clay loam. The lower 6 inches is firm, strong-brown sandy loam. Below the subsoil is yellowish-brown sandy loam that contains beds of soft, weathered sandstone. Bedrock is at a depth of 44 inches.

Clymer soils have moderate to high available moisture capacity and moderate to moderately rapid permeability. Natural fertility is generally low.

Clymer soils are easy to work. They are suited to crops, hay, and pasture.

Representative profile of Clymer loam, 3 to 10 percent slopes, in an old field south of the Raleigh County Airport:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure and weak, fine, subangular blocky; very friable; many roots; very strongly acid; clear, wavy boundary.

B1—8 to 12 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, fine and medium, subangular blocky structure; friable; dark grayish-brown (10YR 4/2) coatings on ped faces and in cracks; many roots; very strongly acid; clear, wavy boundary.

B21t—12 to 22 inches, yellowish-brown (10YR 5/6) heavy fine sandy loam; weak, medium, subangular blocky structure; friable; thin, discontinuous, yellowish-red (5YR 5/6) clay films; 5 percent sandstone fragments; very strongly acid; clear, wavy boundary.

B22t—22 to 32 inches, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) light clay loam; moderate, medium, subangular blocky structure; friable to firm; thin, discontinuous clay films; 5 percent sandstone fragments; very strongly acid; clear, wavy boundary.

B3—32 to 38 inches, strong-brown (7.5YR 5/6) sandy loam; weak, medium, subangular blocky structure; firm; 15 percent soft sandstone fragments; very strongly acid; clear, wavy boundary.

C—38 to 44 inches, yellowish-brown (10YR 5/6) sandy loam; massive; friable; 80 percent yellowish-brown and strong-brown, soft, weathered sandstone; very strongly acid; clear, wavy boundary.

R—44 inches, hard sandstone.

Depth to bedrock ranges from 3½ to 5 feet. Natural reaction is strongly acid to very strongly acid throughout the profile.

The B horizon ranges from clay loam to sandy loam or channery phases of these. This horizon is generally about 5 percent coarse fragments in the upper part and 15 to 25 percent in the lower part.

On flats and benches, the Clymer soils are near the well drained Dekalb and Rayne soils and the moderately well drained Cookport and Wharton soils. Clymer soils are deeper and less sandy than Dekalb soils, are less silty than Rayne soils, and are better drained than Cookport soils and do not have the fragipan that is characteristic of those soils. They are less clayey and better drained than Wharton soils.

Clymer loam, 3 to 10 percent slopes (CIB).—This soil has the profile described as representative of the series. It is in small areas. Included in mapping were areas of nearly level soils, a soil that has a surface layer of fine sandy loam, and small areas of Cookport and Rayne soils.

This Clymer soil is suited to all crops commonly grown in the two counties. The hazard of erosion is moderate in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Working crop residue into the soil also helps maintain the content of organic matter and good tilth. Capability unit IIe–4.

Clymer loam, 10 to 20 percent slopes (CIC).—This soil is shallower than the soil described as representative of the series. It is in small areas. Included in mapping were soils that have a surface layer of fine sandy loam and small areas of Dekalb and Rayne soils.

This soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help control erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes also help limit soil and water losses. Capability unit IIIe–4.

Cookport Series

The Cookport series consists of deep, moderately well drained soils on ridgetops and benches in the central and eastern parts of the survey area. These soils formed in acid material weathered from sandstone and some shale and siltstone. Slopes range from 2 to 8 percent.

In a representative profile in a wooded area the surface layer is very dark grayish-brown loam about 2 inches thick underlain by dark-brown loam about 10 inches thick. The upper part of the subsoil, which is about 8

inches thick, is friable, yellowish-brown light clay loam mottled with light brownish gray in the lower part. The lower part of the subsoil, which extends to a depth of 38 inches, is firm, yellowish-brown light clay loam mottled with yellowish brown and light brownish gray. Below the subsoil is grayish-brown very channery sandy loam mottled with strong brown. Bedrock is at a depth of 42 inches.

Cookport soils have moderate to high available moisture capacity. They have moderately slow permeability in the fragipan and moderate permeability above the fragipan. The water table is moderately high in winter and early spring. Seeps are common. Natural fertility is generally low.

These soils are suited to crops, hay, and pasture. Deep-rooted legumes, however, are not likely to last long. Most of the acreage is used for general crops and pasture.

Representative profile of Cookport loam, 2 to 8 percent slopes, in a wooded area about 2 miles northwest of Layland, in Fayette County:

O1—2 inches to ¼ inch, hardwood leaf litter.

O2—¼ inch to 0, dark-brown, partly decomposed leaf litter.

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam; moderate, fine, granular structure; loose; very strongly acid; abrupt, irregular boundary.

A2—2 to 12 inches, dark-brown (10YR 4/3) loam; dark-brown material in root channels and worm channels; weak, fine, subangular blocky structure; very friable; very strongly acid; clear, wavy boundary.

B21t—12 to 17 inches, yellowish-brown (10YR 5/8) light clay loam; weak, medium and fine, subangular blocky structure; friable; few clay films; very strongly acid; clear, wavy boundary.

B22t—17 to 20 inches, yellowish-brown (10YR 5/8) light clay loam; common, medium, light brownish-gray (2.5Y 6/2) mottles; weak, medium, subangular blocky structure; friable; thin discontinuous clay films; very strongly acid; abrupt, wavy boundary.

Bx—20 to 38 inches, yellowish-brown (10YR 5/4) light clay loam; many, fine and medium, yellowish-brown (10YR 5/8) and light brownish-gray (2.5Y 6/2) mottles; weak, coarse and medium, subangular blocky structure; firm; thin, discontinuous clay films; 10 percent sandstone fragments; very strongly acid; clear, wavy boundary.

C—38 to 42 inches, grayish-brown (2.5Y 5/2) very channery sandy loam; common, fine and medium, strong-brown (7.5YR 5/8) mottles; massive; firm; thin, discontinuous clay films; 60 percent weathered sandstone fragments; very strongly acid; clear, wavy boundary.

R—42 inches, massive standstone.

Depth to bedrock ranges from 40 to 48 inches. Depth to the fragipan is 18 to 26 inches. Depth to low-chroma mottles ranges from 16 to 22 inches. Coarse fragments make up 0 to 15 percent of the solum. Natural reaction is strongly acid to very strongly acid throughout the profile.

The B horizon is light clay loam to sandy clay loam. It is yellowish brown to strong brown.

Cookport soils are next to the well-drained Dekalb and Clymer soils. They are deeper and less sandy than Dekalb soils, are less well drained than either Clymer or Dekalb soils, and have a fragipan in the lower part of the subsoil, which is not present in either Clymer or Dekalb soils.

Cookport loam, 2 to 8 percent slopes (CpB).—This is the only Cookport soil mapped in the survey area. Included in mapping were small areas of a soil that has a surface layer of fine sandy loam. Also included, in the eastern part of Raleigh County, were small areas of soils that are silt loam throughout and have paler colors than those in the soil described as representative of the series.

This soil is suited to all crops commonly grown in the two counties. However, in places deep-rooted legumes do not last long on this moderately wet soil. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the supply of organic matter. Capability unit IIe-13.

Dekalb Series

The Dekalb series consists of moderately deep, well-drained soils on ridgetops, hillsides, and mountainsides in the central and eastern parts of the survey area. These soils formed in acid material weathered from sandstone. They have a channery to very channery subsoil. Slopes range from 3 to 70 percent, but are mostly more than 40 percent. Both very stony and nonstony units were mapped in the survey area, but very stony units make up more than half the acreage.

In a representative profile in a wooded area the surface layer is very dark grayish-brown very stony loam about 2 inches thick underlain by very friable, brown very stony loam about 6 inches thick. The subsoil extends to a depth of 33 inches. The upper 13 inches is friable, yellowish-brown channery fine sandy loam. The lower 12 inches is friable, yellowish-brown very channery sandy loam. Below the subsoil is yellowish-brown very channery sandy loam. Bedrock is at a depth of 39 inches.

Dekalb soils have low to moderate available moisture capacity and rapid permeability. Natural fertility is generally low.

Areas of the less sloping, nonstony Dekalb soils are suited to crops, hay, and pasture. Permanent pasture does not grow well on these somewhat droughty soils. Dekalb soils are fair to good for trees. Most of the acreage is wooded.

The very stony Dekalb soils were mapped with the very stony Gilpin soils in the survey area.

Representative profile of Dekalb very stony loam in an area of Dekalb and Gilpin very stony soils, 20 to 40 percent slopes, about 2½ miles east of Shady Spring in a wooded area a few hundred feet southwest of the Beckley Water Dam, in Raleigh County:

O1—2 inches to ½ inch, leaf litter.

O2—½ inch to 0, partly decomposed leaf litter.

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) very stony loam; moderate, very fine, granular structure; loose; strongly acid; clear, irregular boundary.

A2—2 to 8 inches, brown (10YR 5/3) very stony loam; weak, fine, granular structure; very friable; few roots; 25 percent sandstone fragments; very strongly acid; clear, irregular boundary.

B2—8 to 21 inches, yellowish-brown (10YR 5/6) channery fine sandy loam; weak, medium, subangular blocky structure; friable; 35 percent sandstone fragments; very strongly acid; gradual, irregular boundary.

B3—21 to 33 inches, yellowish-brown (10YR 5/4) very channery sandy loam; weak, fine, subangular blocky structure; friable; 60 percent sandstone fragments; very strongly, acid; gradual, irregular boundary.

C—33 to 39 inches, yellowish-brown (10YR 5/4) very channery sandy loam; massive; 80 percent sandstone fragments; very strongly acid; gradual, wavy boundary.

R—39 inches, hard gray sandstone.

Depth to sandstone bedrock ranges from 20 to 40 inches. Coarse fragments make up more than 35 percent of the profile. Natural reaction is strongly acid to very strongly acid throughout the profile.

The surface layer is fine sandy loam, very stony loam, and channery loam. The B horizon ranges from loam to sandy loam and is commonly channery or very channery phases of these. It is yellowish brown to strong brown. This horizon is 15 to 70 percent coarse fragments. The frequency of occurrence of these fragments increases with depth.

On flats, Dekalb soils are near the well drained Clymer and Rayne soils and the moderately well drained Cookport and Wharton soils. On slopes, they are near the well-drained Calvin, Gilpin, and Muskingum soils. On high mountaintops, they are near the well-drained Summers soils. Dekalb soils are sandier than Calvin, Clymer, Cookport, Wharton, Gilpin or Muskingum soils. They are less red than Calvin soils; are shallower than Clymer, Wharton, or Cookport soils; and do not have the fragipan that is characteristic of Cookport soils. They have a thinner dark-colored surface layer than Summers soils.

Dekalb fine sandy loam, 3 to 10 percent slopes (DbB).—This soil is shallower, is coarser textured, contains fewer sandstone fragments, and is more droughty than the soil described as representative of the series. It is on smooth ridges and mountain flats. Included in mapping were small areas of Cookport and Summers soils and small areas of a soil that is sandy loam throughout.

This Dekalb soil is suited to all crops commonly grown in the two counties. Short-rooted pasture plants do not grow well on this droughty soil. The hazard of erosion is moderate in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion, limit water losses, and maintain good tilth and the content of organic matter. Capability unit IIe–12.

Dekalb fine sandy loam, 10 to 20 percent slopes (DbC).—This soil is coarser textured, contains fewer sandstone fragments, and is more droughty than the soil described as representative of the series. Included in mapping were small areas of Cookport and Clymer soils.

This Dekalb soil is suited to all crops commonly grown in the two counties. Short-rooted pasture plants do not grow well on this droughty soil. The hazard of erosion is severe in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes also help limit soil and water losses. Capability unit IIIe–12.

Dekalb channery loam, 20 to 30 percent slopes (DcD).—This soil has a profile similar to the one described as representative of the series, but the surface is free of stones. Many small sandstone fragments are on the surface and throughout the profile. Included in mapping were small areas of Gilpin soils, small areas where stones are on the surface, and a few small areas of a soil that has steeper slopes.

This soil is suited to all crops commonly grown in the two counties. Short-rooted pasture plants do not grow well on this droughty soil. The hazard of erosion is severe in unprotected areas. In cultivated areas, minimum tillage, contour stripcropping, and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces also help limit soil and water losses. Capability unit IVe–5.

Dekalb channery loam, 30 to 40 percent slopes (DcE).—This soil is similar to the one described as representative of the series, but the surface is free of stones. Many small sandstone fragments are on the surface and throughout the profile. Included in mapping were small areas of Muskingum soils and small areas where stones are on the surface.

Because of the steep slopes, this droughty Dekalb soil is not suited to cultivated crops. It is suited to pasture, but good management is needed to control soil and water losses and keep the soil fertile. Capability unit VIe–2.

Dekalb and Gilpin very stony soils, 5 to 20 percent slopes (DsC).—Areas of this mapping unit are made up of the Dekalb soils, the Gilpin soil, or both. The surface in this unit is shallower, is coarser textured, and contains fewer stone fragments than the soil described as representative of the Dekalb series. The Gilpin soil is similar to the one described as representative of the Gilpin series, but the surface is very stony.

Included with these soils in mapping were small areas of Clymer soils, small areas of stonier soils, and a few areas of nonstony soils.

These very stony soils are unsuited to tilled crops and are poorly suited to pasture. They are suited to trees. Capability unit VIIs–2.

Dekalb and Gilpin very stony soils, 20 to 40 percent slopes (DsE).—Areas of this mapping unit are made up of the Dekalb soil, the Gilpin soil, or both. The surface layer is silt loam, loam, or fine sandy loam, and the soils are very stony. The Dekalb soil has the profile described as representative of the Dekalb series. The Gilpin soil has a very stony surface layer and is generally shallower over bedrock and contains more stone fragments than the soil described as representative of the Gilpin series. Included in mapping were small areas of Muskingum soils.

These very stony soils are unsuited to tilled crops and are poorly suited to pasture. They are suited to trees. Capability unit VIIs–2.

Dekalb and Gilpin very stony soils, 40 to 70 percent slopes (DsF).—The Dekalb soil in this unit is similar to the one described as representative of the Dekalb series, but contains more stone fragments. The Gilpin soil has a very stony surface layer and is generally shallower over bedrock and contains more stone fragments than the soil described as representative of the Gilpin series. Included in mapping were small areas of Muskingum soils.

Very steep slopes and stoniness limit use of these soils for growing trees. Equipment limitations are more severe on these soils than on less sloping ones. Most of the acreage used for trees is in hardwoods and associated species. Capability unit VIIs–2.

Ernest Series

The Ernest series consists of deep, moderately well drained soils on foot slopes throughout the survey area. These soils formed in acid colluvial material from soils on uplands that are underlain by shale, siltstone, and sandstone. Both nonstony and very stony units were mapped in the survey area. Slopes range from 3 to 40 percent.

In a representative profile in an old field the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsoil extends to a depth of 47 inches. The upper 11 inches is friable, strong-brown heavy silt loam and silty clay loam. The next 9 inches is friable to firm, yellowish-brown silty clay loam mottled with light brownish gray and strong brown. The lower part of the

subsoil, which is a fragipan layer, is firm to very firm, light yellowish-brown channery light silty clay loam mottled with light brownish gray and strong brown. Below the subsoil is light brownish-gray silt loam to silty clay loam mottled with brown.

Ernest soils have a moderate to high available moisture capacity. They have moderately slow permeability in the fragipan and moderate permeability above the fragipan. The water table is moderately high in winter and early spring. Seeps are common. Natural fertility is moderate.

The nonstony Ernest soils are suited to crops, hay, and pasture, but in places deep-rooted legumes do not last long. These soils are used mostly for general crops and pasture. Trees grow well on Ernest soils, and most areas of the very stony soils are wooded.

The very stony Ernest soils were mapped with the very stony Shelocta soils in undifferentiated groups in the survey area.

Representative profile of Ernest silt loam, 3 to 10 percent slopes, in an old field about 1 mile east of Layland, in Fayette County:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; common roots; 5 percent coarse fragments; very strongly acid; clear, wavy boundary.

B1—7 to 10 inches, strong-brown (7.5YR 5/8) heavy silt loam; moderate, fine, subangular blocky structure; friable; common roots; brown material filling root channels and wormholes and on ped faces; 5 percent coarse fragments; very strongly acid; clear, wavy boundary.

B21t—10 to 18 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable; few roots; common brown (10YR 4/3) ped faces; thin, discontinuous clay films; 10 percent coarse fragments; very strongly acid; clear, wavy boundary.

B22t—18 to 27 inches, yellowish-brown (10YR 5/6) silty clay loam; many, fine, strong-brown (7.5YR 5/6) and light brownish-gray (2.5Y 6/2) mottles; moderate, medium, subangular blocky structure; friable to firm; common thin, discontinuous clay films; few manganese concretions; 10 percent coarse fragments; very strongly acid; clear, wavy boundary.

Bx—27 to 47 inches, light yellowish-brown (10YR 6/4) channery light silty clay loam; many, fine, light brownish-gray (2.5Y 6/2) and strong-brown (7.5YR 5/8) mottles; weak, medium and coarse, subangular blocky structure; firm to very firm; common manganese concretions; 20 percent coarse fragments; very strongly acid; clear, wavy boundary.

C—47 to 55 inches, light brownish-gray (2.5Y 6/2) silt loam to silty clay loam; many, fine, brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; friable; 10 percent coarse fragments; very strongly acid.

Bedrock is more than 4 feet from the surface. Depth to low-chroma mottles is about 15 to 22 inches. Depth to the fragipan is 20 to 28 inches. Coarse fragments make up 5 to 30 percent of the solum. Natural reaction is very strongly acid to strongly acid throughout the profile.

The B horizon is silty clay loam to heavy silt loam or channery phases of these textures. It is light yellowish brown to strong brown.

Ernest soils are near the well-drained Shelocta and Meckesville soils, the poorly drained Brinkerton soils, and the very poorly drained Lickdale soils. They are less well drained than Shelocta and Meckesville soils and better drained than Brinkerton and Lickdale soils. They are less red than Meckesville soils.

Ernest silt loam, 3 to 10 percent slopes (ErB).—This soil has the profile described as representative of the series. It is in small areas. Included in mapping were small areas of Shelocta soils, small areas of Lickdale soils, areas of a sandier soil, and areas of a redder soil.

This soil is suited to most crops commonly grown in the two counties. The hazard of erosion is moderate in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Seeps may need artificial drainage. Diversion terraces are needed in places to deflect water draining from the uplands. Natural drainageways need to be maintained in sod. Capability unit IIe-13.

Ernest silt loam, 10 to 20 percent slopes (ErC).—This soil has fewer seeps, better surface drainage, and a slightly more weakly developed fragipan than the soil described as representative of the series. Included in mapping were small areas of Shelocta soils, small areas where the surface is very stony, and small areas of sandier soils.

This soil is suited to most crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Seeps may need artificial drainage. Diversion terraces are needed in places to deflect water draining from the uplands. Natural drainageways need to be maintained in sod. Capability unit IIIe-13.

Ernest and Shelocta very stony silt loams, 5 to 20 percent slopes (EsC).—Areas of this mapping unit are made up of the Ernest soil, the Shelocta soil, or both. The Ernest soil and the Shelocta soil have profiles similar to those described as representative of their respective series, but the surface layer is very stony. Included in mapping were a few small areas of very stony alluvial soils at or near the heads of streams.

These soils are too stony to be used for crops or hay. They are suited to pasture, but management is likely to be difficult. They are more suitable for growing trees than for other uses. Capability unit VIs-2.

Ernest and Shelocta very stony silt loams, 20 to 40 percent slopes (EsE).—This mapping unit is on foot slopes and narrow benches and in shallow drainageways that extend most of the way up the mountainsides. Areas of this unit consist of the Ernest soil, the Shelocta soil, or both. The Ernest soil has a more weakly developed fragipan and contains more channery fragments than the one described as representative of the Ernest series. The Shelocta soil contains more channery fragments than the one described as representative of the Shelocta series. Both soils have a very stony surface layer.

These very stony soils are unsuited to crops or hay and are poorly suited to pasture. They are suitable for growing trees. Capability unit VIIs-2.

Gilpin Series

The Gilpin series consists of moderately deep, well-drained soils on rolling shale ridges and mountainsides in the central and eastern parts of the survey area. These soils formed in acid material weathered from siltstone, shale, and soft sandstone. Slopes range from 3 to 65 percent.

In a representative profile in an old field the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil, which extends to a depth of 22 inches, is friable, yellowish-brown silt loam in the upper 3 inches and friable to firm, yellowish-brown channery silty clay loam in the lower 11 inches. Below the subsoil is yellowish-brown heavy silt loam that contains thin beds of siltstone. Hard gray shale bedrock is at a depth of 31 inches.

Gilpin soils have moderate to high available moisture capacity and moderate permeability. Natural fertility is moderate.

Areas of the less sloping, nonstony Gilpin soils are suited to crops, hay, and pasture. Areas of the steeper and very stony soils are limited to growing trees. They are well suited to oaks, yellow-poplar, and associated species.

The very stony Gilpin soils were mapped with the very stony Dekalb soils and the very stony Calvin soils in the survey area.

Representative profile of Gilpin silt loam, 10 to 20 percent slopes, in an old field about one-half mile north of Glen Jean, in Fayette County:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; common roots; 5 percent shale fragments; strongly acid; clear, wavy boundary.

B1—8 to 11 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine and medium, subangular blocky structure; friable; common root holes filled with dark grayish-brown (10YR 4/2) silty material; 5 percent shale and siltstone fragments; strongly acid; clear, wavy boundary.

B2t—11 to 22 inches, yellowish-brown (10YR 5/6) channery silty clay loam; moderate, medium, subangular blocky structure; friable to firm; common ped faces of yellowish brown; thin, discontinuous clay films; 20 percent shale and siltstone fragments; strongly acid; gradual, wavy boundary.

C—22 to 31 inches, yellowish-brown (10YR 5/6) heavy silt loam; massive; friable; 90 percent soft, thin, bedded, gray and brown siltstone; strongly acid; gradual, irregular boundary.

R—31 inches, hard gray shale.

Depth to bedrock ranges from 24 to 34 inches. Natural reaction is strongly acid to very strongly acid throughout the profile.

The B horizon is silty clay loam to silt loam or channery phases of these. It is yellowish brown or strong brown. This horizon is 5 to 30 percent coarse fragments.

On smooth ridges, Gilpin soils are near the well drained Rayne soils, the moderately well drained Wharton soils, and to a lesser extent, the Summers soils. On slopes, they are next to and in a mixed pattern with the well-drained Calvin and Dekalb soils, and to a lesser extent, the Muskingum soils. They are shallower than Rayne and Wharton soils, generally have a less clayey B horizon than Wharton soils, are less sandy than Dekalb and Summers soils, and have a more clayey B horizon than Calvin and Muskingum soils.

Gilpin silt loam, 3 to 10 percent slopes (GIB).—This soil is slightly deeper over bedrock than the one described as representative of the series. Included in mapping were small areas of Rayne and Wharton soils.

This Gilpin soil is suited to most crops commonly grown in the two counties. Most of the acreage is in crops. The hazard of erosion is moderate in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence are needed to help control erosion and maintain good tilth and the content of organic matter. Natural drainageways need to be maintained in sod. Capability unit IIe–10.

Gilpin silt loam, 10 to 20 percent slopes (GIC).—This soil has the profile described as representative of the series. Included in mapping were a few narrow bands of Wharton soils and small areas of Dekalb and Rayne soils.

This Gilpin soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes also help limit soil and water losses. Natural drainageways need to be maintained in sod. Capability unit IIIe–10.

Gilpin silt loam, 10 to 20 percent slopes, severely eroded (GIC3).—Erosion has removed most of the original surface layer from this soil. Shallow gullies are present in some areas. The surface layer contains more stone fragments than that of less eroded soils. This soil is more eroded, is shallower over bedrock, and contains more stone fragments than the one described as representative of the series. Included in mapping were a few narrow bands of Wharton soils and small areas of Dekalb soils.

This Gilpin soil is suited to all crops commonly grown in the two counties. The hazard of erosion is very severe in unprotected areas. In cultivated areas, minimum tillage, contour stripcropping, and cropping systems that include hay in the cropping sequence help to control further erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes also help limit soil and water losses. Natural drainageways need to be maintained in sod. Capability unit IVe–3.

Gilpin silt loam, 20 to 30 percent slopes (GID).—This soil is somewhat shallower over bedrock and contains slightly more shale fragments than the one described as representative of the series. Included in mapping were areas of soils that have a channery surface layer and small areas of Dekalb soils.

This Gilpin soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, minimum tillage, contour stripcropping, and long cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes also help limit soil and water losses. Natural drainageways need to be maintained in sod. Capability unit IVe–3.

Gilpin silt loam, 20 to 30 percent slopes, severely eroded (GID3).—Erosion has removed most of the original surface layer from this soil. Shallow gullies are present in some areas. The surface layer contains more stone fragments than those of less eroded Gilpin soils. This soil is more eroded, is slightly shallower over bedrock, and contains more stone fragments than the one described as representative of the series. Included in mapping were areas of soils that have a channery surface layer and small areas of Dekalb soils.

The hazard of erosion is very severe in unprotected areas. This Gilpin soil is unsuited to cultivated crops. It is suited to pasture, but good management is needed to prevent further erosion and to rebuild tilth and fertility. This soil is also suited to trees (fig. 4). Capability unit VIe–2.

Figure 4.—Gilpin silt loam, 20 to 30 percent slopes, on the north aspect in an excellent pole stand of yellow-poplar.

Gilpin silt loam, 30 to 40 percent slopes (GIE).—This soil is shallower over bedrock and contains more stone fragments than the one described as representative of the series. Included in mapping were small areas of soils that have a channery surface layer, small areas of Dekalb and Muskingum soils, and small areas where stones are on the surface.

Steep slopes make this Gilpin soil unsuited to cultivated crops. It is suited to pasture, but good pasture management is needed to maintain fertility. Capability unit VIe–2.

Gilpin silt loam, 30 to 40 percent slopes, severely eroded (GIE3).—Erosion has removed most of the original surface layer from this soil. Shallow gullies are present in places. The surface layer contains more stone fragments than those of less eroded Gilpin soils. This soil is more eroded, is shallower over bedrock, and contains more stone fragments than the one described as representative of the series. Included in mapping were small areas of soils that have a channery surface layer, small areas of a soil that is less than 20 inches deep over bedrock, and small areas of Dekalb and Muskingum soils.

This steep, severely eroded Gilpin soil is unsuited to crops or hay and is poorly suited to pasture. The hazard of erosion is very severe in unprotected areas. Controlling erosion and establishing and maintaining pasture are difficult on this soil. The soil is more suitable for growing trees than for other uses. Capability unit VIIe–2.

Gilpin silt loam, 40 to 65 percent slopes (GIF).—This soil contains more stone fragments than the one described as representative of the series. Included in mapping were small areas of Dekalb and Muskingum soils and areas where in places stones or flagstones are on the surface.

This Gilpin soil is unsuited to crops or hay and is poorly suited to pasture. Pasture management is very difficult on this very steep soil. The soil is more suitable and important for growing trees than for other uses. Oak and associated hardwoods grow well on it. Capability unit VIIe–2.

Gilpin silt loam, 40 to 65 percent slopes, severely eroded (GIF3).—Erosion has removed most of the original surface layer from this soil. Shallow gullies are present in places. This soil contains more stone fragments and is shallower over bedrock than the one described as representative of the series. Included in mapping were small areas of Dekalb and Muskingum soils and some areas where in places stones or flagstones are on the surface.

This Gilpin soil is unsuited to crops or hay and is poorly suited to pasture. Pasture management is very difficult on this very steep, severely eroded soil. It is more

suitable for growing trees than for other uses. Capability unit VIIe-2.

Gravelly Alluvial Land

Gravelly alluvial land (Gr) consists of deep, droughty, mixed gravelly and sandy material on flood plains. Slopes are mainly 3 to 8 percent. This recently deposited alluvium washed from soils on uplands that are underlain by acid sandstone, siltstone, and shale. It is most common along small streams in the western part of the survey area. Content of gravel and cobblestones is highly variable. Cobblestones and large pebbles are most common near the mouth of small side streams. Depth to bedrock ranges from 3 to 5 feet or more. This land is flooded annually or more often.

Included with this unit in mapping were some areas where there is little or no gravel; small, moderately well drained areas; and small areas of riverwash along the New River.

Gravelly alluvial land is next to well-drained Chavies and Pope soils, moderately well drained Philo soils, and poorly drained Atkins soils. It contains more gravel and is more droughty than these soils.

This land is droughty, but the water table is at a depth of 3 to 5 feet. Natural fertility is moderate.

Gravel makes this land difficult to plow. Shallow-rooted crops do not grow well in dry seasons. Deep-rooted meadow crops are better suited than other plants. Capability unit IIIs-6.

Landes Series

The Landes series consists of deep, well-drained soils on flood plains along the New and Kanawha Rivers. These soils formed in mixed material washed from soils on uplands underlain by sandstone, shale, and limestone. They are occasionally flooded. Slopes range from 0 to 3 percent.

In a representative profile in a garden the surface layer is very dark grayish-brown fine sandy loam about 11 inches thick. The subsoil, which extends to a depth of 31 inches, is friable, dark yellowish-brown fine sandy loam in the upper 6 inches and very friable, dark-brown fine sandy loam in the lower 14 inches. Below the subsoil is stratified dark-brown to yellowish-brown sandy loam and silt loam.

Landes soils have moderate to high available moisture capacity and moderately rapid permeability. Natural fertility is moderate to high.

These soils are easy to work and are suited to crops, hay, and pasture. In places crops are damaged by flooding.

Representative profile of Landes fine sandy loam along the Kanawha River just south of Glen Ferris, in Fayette County:

Ap—0 to 11 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; slightly acid; abrupt, wavy boundary.

B21—11 to 17 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, subangular blocky structure; friable; many roots; many wormholes; few ped faces in wormholes; neutral; clear, wavy boundary.

B22—17 to 31 inches, dark-brown (7.5YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; very friable; many roots; few dark grayish-brown (10YR 4/2) silt films; neutral; clear, wavy boundary.

C—31 to 60 inches, stratified dark-brown (7.5YR 4/4) to yellowish-brown (10YR 5/4) sandy loam and silt loam; very friable to loose; few roots; neutral.

Depth to bedrock is more than 5 feet. Natural reaction is slightly acid to neutral throughout the profile.

The B horizon ranges from fine sandy loam to loam. It is yellowish brown to dark brown. The C horizon in places has mottles below a depth of 40 inches and contains small pebbles.

Landes soils in Fayette and Raleigh Counties do not have the free carbonates in the lower part of the subsoil that are characteristic of the series as now defined. This difference does not alter the usefulness or behavior of the soils.

Landes soils are next to the well-drained Ashton soils. They are on lower flood plains, have a sandier B horizon, and are more frequently flooded than Ashton soils.

Landes fine sandy loam (La).—This is the only Landes soil mapped in the survey area. It is nearly level. Included in mapping were small areas of a soil having a surface layer of dark brown, small areas of a soil having a surface layer of loam, and small areas of moderately well drained and poorly drained soils.

This soil is used mostly for garden and other tilled crops. Continuous row crops can be grown, but they need the protection of a cover crop. Working crop residue into the soil improves the available moisture capacity, fertility, and tilth. Capability unit IIw-6.

Lickdale Series

The Lickdale series consists of deep, very poorly drained soils on lower foot slopes and around concave heads of streams. These soils formed in acid colluvial material weathered from soils on uplands that are underlain by shale, siltstone, and sandstone. They are most common in the southern and eastern parts of Raleigh County. Slopes range from 0 to 3 percent, but slopes of 2 to 3 percent are dominant.

In a representative profile in a pasture the surface layer is very dark grayish-brown silt loam about 10 inches thick mottled with strong brown. The upper 8 inches of the subsoil is friable, grayish-brown silt loam. The next 10 inches is friable, grayish-brown silty clay loam mottled with yellowish brown. The lower part of the subsoil, which extends to a depth of 40 inches, is friable to firm, gray heavy silt loam to clay loam mottled with yellowish brown. Below the subsoil is gray silt loam mottled with yellowish brown.

Lickdale soils have moderate to high available moisture capacity and slow permeability. Natural fertility is low or moderately low. The water table is high during winter and early spring.

Unless artificially drained, these wet soils are poorly suited to crops, hay, and pasture.

Representative profile of Lickdale silt loam in a brushy pasture near Oak Creek, east of the Turnpike, in Raleigh County:

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; common, fine, strong-brown (7.5YR 5/8) mottles in root holes; weak, fine, granular structure and weak, fine, subangular blocky; very friable; many fine roots; very strongly acid; clear, irregular boundary.

B1g—10 to 18 inches, grayish-brown (2.5Y 5/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine and medium, subangular

blocky structure; friable; many fine roots; very strongly acid; clear, wavy boundary.

B21g—18 to 28 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, yellowish-brown (10YR 5/6) mottles; weak and moderate, medium, subangular blocky structure; friable; common roots; very strongly acid; clear, wavy boundary.

B22tg—28 to 40 inches, gray (10YR 5/1) heavy silt loam to clay loam; many, medium, yellowish-brown (10YR 5/8) mottles; weak and moderate, medium and coarse, subangular blocky structure; friable to firm; few roots; thin, discontinuous clay films; common pores; very strongly acid; clear, wavy boundary.

Cg—40 to 60 inches, gray (10YR 5/1) silt loam; few yellowish-brown (10YR 5/6) spots; massive; friable; occasional roots; very strongly acid.

Depth to bedrock is more than 5 feet. Coarse fragments are almost absent. Natural reaction is very strongly acid throughout the profile.

The very dark grayish-brown A horizon ranges from 6 to 10 inches in thickness. The B horizon is silty clay loam, clay loam, or heavy silt loam.

Lickdale soils are next to the moderately well drained Ernest soils and the poorly drained Brinkerton soils. They are less well drained than those soils.

Lickdale silt loam (Lc).—This is the only Lickdale soil mapped in the survey area. Less than one-half the acreage of this nearly level, wet soil has been cleared. Most areas are in brushy, low-grade pasture. The water table is at or near the surface during winter and early spring. Local ponding of short duration occurs in places. Included in mapping were a few small, very stony areas.

Unless artificially drained, this soil has little value for farming, except in places for low-producing wild pasture. Artificial drainage is difficult in some areas. Diversion terraces are helpful in places to divert water coming from hillsides. In drained areas, this soil is suited to cultivated crops and wet-tolerant grasses. Crops need to be grown in long cropping systems that include hay in the cropping sequence. Pasturing and tillage need to be delayed until the soil is reasonably firm to avoid compaction and loss of tilth. Capability unit IVw-1.

Made Land

Made land (Mo) is most commonly around coal mining properties and communities where mine waste material, or "red dog," has been spread on low ground or used to fill the bottoms of narrow, steep-sided valleys to make areas nearly level. Mine buildings, dwellings, and other structures, including roads and railroads, are constructed on this land. Long, narrow areas of this fill land are very common along small streams where a railroad is on one side of the stream and a highway is on the other. In the neighborhood of Alloy in Fayette County, furnace slag has been used in a similar manner.

This land, although somewhat variable, is nearly level, is stable for buildings, and does not erode severely. Due to the high content of stones, the droughtiness, and the compaction characteristics, it supports little vegetation. Made land is not classified as to land capability.

Meckesville Series

The Meckesville series consists of deep, well-drained soils on foot slopes and around the heads of streams in small areas along the eastern edge of the two counties. These soils formed in colluvium from soils on uplands that are underlain by red and gray shale and siltstone. Some strata of these rocks are calcareous. Slopes range from 3 to 40 percent.

In a representative profile in a wooded area the surface layer is dark reddish-brown silt loam about 4 inches thick. The subsoil extends to a depth of 62 inches. The upper 19 inches is friable, dark reddish-brown and reddish-brown silty clay loam to clay loam. The next 15 inches is firm, dark reddish-brown channery silty clay loam. The lower part of the subsoil is a firm fragipan layer about 24 inches thick. It is reddish-brown channery light silty clay loam mottled with light brownish gray and yellowish brown in the upper part and mixed yellowish-red, yellowish-brown, and light brownish-gray light silty clay loam in the lower part. Below the subsoil is dark-brown and strong-brown silty clay loam.

Meckesville soils have high available moisture capacity. They have moderately slow permeability in the fragipan and moderate permeability above the fragipan. Natural fertility is moderate to high.

Areas of the nonstony Meckesville soils are suited to crops, hay, and pasture. Most areas of the very stony soils are wooded.

Representative profile of Meckesville silt loam, 10 to 20 percent slopes, in a wooded area on upper Pinch Creek, north of Pluto, in Raleigh County:

A1—0 to 4 inches, dark reddish-brown (5YR 3/2) silt loam; strong, very fine, granular structure; very friable; many roots; 5 percent siltstone fragments; strongly acid; clear, irregular boundary.

B1—4 to 9 inches, dark reddish-brown (5YR 3/4) silty clay loam; moderate, fine, subangular blocky structure; friable; many roots; 5 percent siltstone fragments; strongly acid; gradual, wavy boundary.

B21t—9 to 23 inches, reddish-brown (5YR 4/4) silty clay loam to clay loam; strong, medium and fine, subangular blocky structure; friable; many roots; thin, discontinuous clay films; 5 percent siltstone fragments; strongly acid; gradual, wavy boundary.

B22t—23 to 38 inches, dark reddish-brown (5YR 3/4) channery silty clay loam; moderate, medium, subangular blocky structure; firm; many roots; thin, discontinuous clay films; few black specks; many yellow specks in lower 3 inches; 20 percent siltstone fragments; very strongly acid; clear, wavy boundary.

Bx1—38 to 50 inches, reddish-brown (5YR 4/4) channery light silty clay loam; occasional, fine, light brownish-gray (2.5Y 6/2) and yellowish-brown (10YR 5/8) mottles; firm; few roots; thin, discontinuous clay films; few black specks; many yellow specks; 20 percent siltstone fragments; very strongly acid; clear, wavy boundary.

Bx2—50 to 62 inches, mixed yellowish-red (5YR 4/8), yellowish-brown (10YR 5/8), and light brownish-gray (2.5Y 6/2) light silty clay loam; weak, coarse, subangular blocky structure; firm; thin, discontinuous clay films; 15 percent siltstone fragments; very strongly acid; clear, wavy boundary.

C—62 to 70 inches, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/8) silty clay loam; massive; firm; 30 percent siltstone fragments; very strongly acid.

Depth to bedrock is more than 5 feet. Depth to the fragipan ranges from 34 to 40 inches. Coarse fragments make up 5 to 30 percent of the material in the solum. Natural reaction is very strongly acid to strongly acid throughout the profile.

The B horizon ranges from silty clay loam to clay loam or channery phases of these. It is reddish brown to dark reddish brown in the upper part and mixed yellowish red, yellowish brown, and light brownish gray in the lower part.

Meckesville soils in places are next to the moderately well drained Ernest soils. They are redder and better drained than those soils.

Meckesville silt loam, 3 to 10 percent slopes (McB).—The fragipan in this soil is generally closer to the surface than the one in the soil described as representative of the series. Included in mapping were small areas of Ernest soils.

Much of the acreage of this soil has been cleared and is suited to all crops commonly grown in the two counties. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and fertility. In some areas, diversion terraces are helpful in diverting runoff from hillsides. Natural drainageways need to be maintained in sod. Capability unit IIe-4.

Meckesville silt loam, 10 to 20 percent slopes (McC).—This soil has the profile described as representative of the series. Included in mapping were small areas of soils having slopes of more than 20 percent and small areas of Ernest soils.

Much of the acreage of this soil has been cleared and is moderately well suited to all crops commonly grown in the two counties. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence are needed to control erosion and maintain good tilth and fertility. In some areas, diversion terraces are helpful in diverting runoff from hillsides. Natural drainageways need to be left in sod. Capability unit IIIe-4.

Meckesville very stony silt loam, 10 to 20 percent slopes (MdC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is very stony. Included in mapping were a few small areas that are more stony and a few small areas of Ernest soils.

This soil is too stony to be used for crops or hay, but it is suited to pasture. Grass grows well, but stoniness is a moderate management limitation. Capability unit VIs-2.

Meckesville very stony silt loam, 20 to 40 percent slopes (MdE).—This soil has a profile similar to the one described as representative of the series, but the surface is very stony. Included in mapping were small areas of Calvin and Gilpin very stony soils.

This moderately steep to steep, very stony Meckesville soil is more suitable for growing trees than for other uses. Oaks and associated hardwoods grow well on it. Capability unit VIIs-2.

Mine Dump

Mine dump (Me) consists of large piles of waste from deep coal mines. A mixture of coal, slate, sandstone, and shale makes up this refuse material, which is piled in steep-sided heaps near openings of mines.

Most of this material is normally incapable of producing any worthwhile vegetation. Trees, shrubs, and vines become established in places and help to stabilize the mounds.

Many dumps catch fire by spontaneous combustion and burn for long periods. Burned dumps are a common source of surfacing material for roads and lanes and for fills on which various structures are erected. Locally, this material is called "red dog." Mine dump is not classified as to land capability.

Monongahela Series

The Monongahela series consists of deep, moderately well drained soils on old stream terraces along the larger streams of the survey area. These soils formed in acid alluvial material washed from soils underlain by shale, siltstone, and sandstone. Slopes range from 0 to 10 percent.

In a representative profile in an old field the surface layer is silt loam about 13 inches thick. The upper 7 inches is dark grayish brown, and the lower 6 inches is friable and yellowish brown. The subsoil extends to a depth of more than 56 inches. The upper 10 inches is friable, yellowish-brown heavy silt loam. The next 5 inches is friable, yellowish-brown heavy silt loam mottled with light brownish gray. The lower part of the subsoil, a fragipan layer, is firm to very firm, yellowish-brown heavy silt loam to clay loam mottled with yellowish brown, light brownish gray, pale olive, and reddish yellow.

Monongahela soils have high available moisture capacity. They have moderately slow permeability in the fragipan and moderate permeability above the fragipan. Natural fertility is low. The water table is moderately high in winter and early spring. Seeps are common.

These soils are suited to crops, hay, and pasture. They are used for pasture and a variety of crops. Deep-rooted legumes do not last long in places because of the fragipan.

Representative profile of Monongahela silt loam, 3 to 10 percent slopes, in an old field just north of Beaver, in Raleigh County:

O2—1 inch to 0, black rotted leaves and lichens.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, very fine, granular structure; very friable; very strongly acid; clear, smooth boundary.

A2—7 to 13 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable; dark grayish-brown (10YR 4/2) streaks and root holes, decreasing with increasing depth; very strongly acid; clear, wavy boundary.

B21t—13 to 23 inches, yellowish-brown (10YR 5/6) heavy silt loam; moderate, fine, subangular blocky structure; friable; thin, discontinuous clay films; very strongly acid; clear, wavy boundary.

B22t—23 to 28 inches, yellowish-brown (10YR 5/8) heavy silt loam; common, medium, light brownish-gray (2.5Y 6/2) mottles; moderate, medium, subangular blocky structure; friable; thin, discontinuous clay films; very strongly acid; clear, wavy boundary.

Bx1—28 to 36 inches, yellowish-brown (10YR 5/8) heavy silt loam to clay loam; many, fine and medium, pale-olive (5Y 6/3) and reddish-yellow (7.5YR 6/8) mottles; moderate, medium and coarse, subangular blocky structure; film; thin, discontinuous clay films; many manganese concretions; very strongly acid; clear, irregular boundary.

Bx2—36 to 56 inches, yellowish-brown (10YR 5/6) heavy silt loam to clay loam; many, fine and coarse, yellowish-brown 10YR 5/8), light brownish-gray (2.5Y 6/2), and reddish-yellow (7.5YR 6/8) mottles; moderate, coarse, subangular blocky structure; very firm; very strongly acid.

Depth to bedrock is more than 5 feet. Depth to low-chroma mottles ranges from 18 to 24 inches, and depth to the fragipan is 24 to 30 inches. Coarse fragments are almost absent, but a few cobblestones or pebbles are present in places below a depth of 30 inches. Natural reaction is very strongly acid to strongly acid throughout the profile.

It is dominantly yellowish brown but ranges from light yellowish brown to brown.

Monongahela soils are the only soils in the two counties mapped on stream terraces.

Monongahela silt loam, 0 to 3 percent slopes (MgA).—This soil is slightly wetter and has poorer surface drainage than the one described as representative of the series. Included in mapping were small areas of well-drained and somewhat poorly drained soils and areas of soils having a surface layer of loam.

This soil is suited to all crops commonly grown in the two counties. Continuous row crops can be grown, but the soil needs the protection of cover crops between growing seasons. Working crop residue into the soil helps to improve or maintain tilth and fertility. Small wet areas need artificial drainage in places. Diversion terraces are needed in places to divert runoff from adjacent slopes. Capability unit IIw–1.

Monongahela silt loam, 3 to 10 percent slopes (MgB).—This soil has the profile described as representative of the series. Surface drainage is fair to good. Included in mapping were small areas of well-drained soils and small areas of soils that are loamy throughout.

This soil is suited to crops, hay, and pasture. The hazard of erosion is moderate in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces are needed in places to divert runoff from adjacent slopes. Capability unit IIe–13.

Muskingum Series

The Muskingum series consists of moderately deep, well-drained soils on strongly dissected uplands in the western part of the survey area. These soils formed in acid material weathered from siltstone, shale, and some sandstone. Slopes range from 10 to 75 percent, but slopes of more than 40 percent are dominant. Both nonstony and very stony units are mapped in the survey area, but the very stony units make up about two-thirds of the acreage.

In a representative profile in a wooded area the surface layer is very dark grayish-brown silt loam about 3 inches thick underlain by very friable, brown silt loam about 8 inches thick. The subsoil, which is about 21 inches thick, is friable, yellowish-brown channery silt loam. Below the subsoil is yellowish-brown very channery silt loam that contains beds of brown and gray siltstone and fine-grained sandstone.

Muskingum soils have high available moisture capacity and moderate permeability. Natural fertility is moderate to moderately high.

The less sloping, nonstony Muskingum soils are suited to crops, hay, and pasture. Most areas of Muskingum soils are wooded. They are well suited to yellow-poplar, oaks, and associated hardwoods.

Representative profile of Muskingum silt loam, 40 to 75 percent slopes, in a wooded area about 3½ miles east of Arnett, in Raleigh County:

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; very friable; loose; many roots; 10 percent stone fragments; medium acid; clear, wavy boundary.

A2—3 to 11 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure and weak, fine, subangular blocky; very friable; common roots; 15 percent stone fragments; strongly acid; clear, wavy boundary.

B2—11 to 24 inches, yellowish-brown (10YR 5/6) channery silt loam; weak to moderate, fine and medium, subangular blocky structure; friable; yellowish-brown (10YR 5/6) root hole fillings; few roots; 20 percent stone fragments; very strongly acid; gradual, wavy boundary.

B3—24 to 32 inches, yellowish-brown (10YR 5/6) channery silt loam; weak, fine and medium, subangular blocky structure; friable; small strong-brown (7.5YR 5/6) spots; 30 percent coarse fragments; very strongly acid; gradual, wavy boundary.

C—32 to 35 inches, yellowish-brown (10YR 5/4) very channery silt loam; massive; friable; 90 percent brown and gray, flat, bedded siltstone and fine-grained sandstone; very strongly acid; clear, irregular boundary.

R—35 inches, somewhat broken siltstone.

Depth to bedrock ranges from 24 to 40 inches. Natural reaction in the B and C horizons ranges from strongly to very strongly acid.

The B horizon ranges from yellowish brown to strong brown. Coarse fragments make up 10 to 30 percent of the material in the solum.

On slopes, Muskingum soils are next to the well-drained Dekalb soils and, to a lesser extent, the well-drained Gilpin soils. On nearby smooth ridgetops, they are near the moderately well drained Wharton soils and the well drained Rayne soils. Muskingum soils are more silty and less sandy than Dekalb soils. They have a less clayey B horizon than Gilpin soils and are more shallow over bedrock and have a less clayey B horizon than either Wharton or Rayne soils.

Muskingum silt loam, 10 to 20 percent slopes (MkC).—This soil is shallower over bedrock and contains less stone fragments than the one described as representative of the series. Included in mapping were a few small areas of Dekalb, Wharton, and Rayne soils, a few small areas where stones are on the surface, and a few areas of soils having a surface layer of channery silt loam and channery loam.

This Muskingum soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes also help limit soil and water losses. Natural drainageways need to be maintained in sod. Capability unit IIIe–10.

Muskingum silt loam, 10 to 20 percent slopes, severely eroded (MkC3).—Erosion has removed most of the original surface layer from this soil. This soil is more eroded, is shallower over bedrock, and contains less stone fragments than the one described as representative of the series. Included in mapping were a few small areas of Wharton and Rayne soils.

This Muskingum soil is suited to all crops commonly grown in the two counties. The hazard of erosion is very severe in unprotected areas. In cultivated areas, minimum tillage, contour stripcropping, and cropping systems that include hay in the cropping sequence help to control future erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes also help limit soil and water losses. Natural drainageways need to be maintained in sod. Capability unit IVe–3.

Muskingum silt loam, 20 to 30 percent slopes (MkD).—This soil contains less coarse fragments than the one described as representative of the series. Included in mapping were small areas of Dekalb and Gilpin soils and small areas of soils having a surface layer of channery silt loam and channery loam.

This Muskingum soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, minimum tillage, contour stripcropping, and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes also help control soil and water losses. Natural drainageways need to be maintained in sod. Capability unit IVe–3.

Muskingum silt loam, 20 to 30 percent slopes, severely eroded (MkD3).—Erosion has removed most of the original surface layer from this soil. Shallow gullies are present in places. This soil is more eroded and contains less stone fragments than the one described as representative of the series. Included in mapping were small areas of Dekalb and Gilpin soils and small areas of soils having a channery surface layer.

The hazard of erosion is very severe in unprotected areas. This soil is unsuited to cultivated crops. It is suited to pasture, but good management is needed to prevent further erosion and to rebuild tilth and fertility. Capability unit VIe–2.

Muskingum silt loam, 30 to 40 percent slopes (MkE).—This soil has a profile similar to the one described as representative of the series, but contains slightly less coarse fragments. Included in mapping were small areas where stones are on the surface, small areas of Dekalb and Gilpin soils, and small areas of soils having a surface layer of channery silt loam and channery loam.

This Muskingum soil is unsuited to cultivated crops because it is steep. It is suited to pasture, but good management is needed to control soil and water losses and maintain fertility. Capability unit VIe–2.

Muskingum silt loam, 30 to 40 percent slopes, severely eroded (MkE3).—Erosion has removed most of the original surface layer from this soil. The surface layer contains more coarse fragments than the less eroded Muskingum soils. This soil is more eroded, shallower over bedrock, and more droughty than the one described as representative of the series. Included in mapping were small areas of Dekalb and Gilpin soils, small areas where stones are on the surface, and small areas of soils having a channery surface layer.

This Muskingum soil is unsuited to crops or hay. It is poorly suited to pasture. The hazard of erosion is very severe in unprotected areas. Controlling erosion and establishing and maintaining pasture are difficult on this soil. This soil is more suitable for trees than for other uses. Capability unit VIIe–2.

Muskingum silt loam, 40 to 75 percent slopes (MkF).—This soil has the profile described as representative of the series. It is on rugged mountains and generally covers large areas. Included in mapping were small areas of Dekalb and Shelocta soils and small areas where stones are on the surface.

Steep slopes limit the use of this Muskingum soil to trees. It is a good to excellent soil for growing yellow-poplar, oaks, and associated hardwoods. Capability unit VIIe–2.

Muskingum very stony silt loam, 20 to 40 percent slopes (MnE).—This soil is slightly shallower over bedrock and more droughty than the one described as representative of the series. Also, the surface is very stony. This soil commonly occurs on ridgetops and points. Included in mapping were small areas of Dekalb soils.

Slopes and stoniness limit the use of this Muskingum soil to trees. Capability unit VIIs–2.

Muskingum very stony silt loam, 40 to 75 percent slopes (MnF).—This soil is deeper and contains more coarse fragments than the one described as representative of the series. It is on rugged mountains and generally covers large areas. Included in mapping were small areas of Dekalb and Shelocta soils and areas of Steep rock land.

Because of very steep slopes this soil is used only for wooded areas, as wildlife habitat, and for recreation. Some areas have been strip mined (fig. 5). Most of the acreage is wooded. Capability unit VIIs–2.

Philo Series

The Philo series consists of deep, moderately well drained soils on flood plains along the smaller streams throughout the survey area, but mostly in the central and eastern parts of the survey area. Slopes are 0 to 3 percent. These soils formed in acid alluvial material washed from soils on uplands that are underlain by sandstone, siltstone, and shale. They are flooded at occasional to frequent intervals.

In a representative profile in a pasture the surface layer is thin, very dark grayish-brown silt loam about 3 inches thick underlain by very friable dark-brown silt loam about 7 inches thick. The subsoil is about 18 inches thick. The upper 10 inches is dark yellowish-brown silt loam and light silt loam mottled with grayish brown. The lower part is friable, dark grayish-brown loam mottled with gray and strong brown. Below the subsoil is friable, gray loam that contains thin, discontinuous layers or pockets of sandy loam and is mottled with dark brown and yellowish red.

Philo soils have high available moisture capacity and moderate to moderately slow permeability. The water table is moderately high in winter and early in spring. Natural fertility is moderate.

These soils are easy to work and are suited to crops, hay, and pasture. Deep-rooted legumes may not last long on this moderately wet soil.

Representative profile of Philo silt loam in a pasture field along Paint Creek near Sweeneysburg, in Raleigh County:

Ap1—0 to 3 inches, very dark grayish-brown (10YR 3/2 silt loam, weak, very fine, granular structure; very friable; many roots; strongly acid; clear, wavy boundary.

Ap2—3 to 10 inches, dark-brown (10YR 4/3) silt loam; weak, fine, subangular blocky structure; very friable; many roots; very strongly acid; abrupt, wavy boundary.

B21—10 to 15 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; very strongly acid; clear, wavy boundary.

B22—15 to 20 inches, dark yellowish-brown (10YR 4/4) light silt loam; few, fine, grayish-brown (2.5Y 5/2) mot-

Figure 5.—**Strip mining of coal from a ridge of Muskingum very stony silt loam, 40 to 75 percent slopes.**

tles; weak, fine and medium, subangular blocky structure; friable; few roots; very strongly acid; clear, wavy boundary.

B3—20 to 28 inches, dark grayish-brown (2.5Y 4/2) loam; common, fine and medium, gray (10YR 5/1) and strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; friable; few roots; very strongly acid; clear, wavy boundary.

Cg—28 to 50 inches, gray (5Y 5/1) loam; many, fine, dark-brown (7.5YR 3/2) and yellowish-red (5YR 4/8) mottles; massive; friable; few, thin, discontinuous layers or pockets of sandy loam; few, fine, black concretions; very strongly acid.

Depth to bedrock is more than 4 feet. Depth to low-chroma mottles ranges from 15 to 22 inches. Natural reaction is strongly acid to very strongly acid throughout the profile.

The B horizon is dominantly light silt loam in the upper part and loam to fine sandy loam in the lower part. It ranges from dark yellowish brown to yellowish brown and dark grayish brown. The C horizon in places contains stratified sandy loam, loamy sand, sand, and fine gravel.

Philo soils are next to the well-drained Pope soils and the poorly drained Atkins soils. They are less well drained than Pope soils and better drained than Atkins soils.

Philo silt loam (Ph).—This nearly level soil is the only Philo soil mapped in the survey area. The water table is within 1 to 2 feet of the surface during winter and early spring. Included in mapping were small areas of Pope and Atkins soils, small areas of somewhat poorly drained soils, and areas of soils having a surface layer of loam.

This Philo soil is suited to all crops commonly grown in the two counties. Continuous row crops can be grown. A cover crop protects them from scouring during seasonal flooding. Working crop residue into the soil improves its tilth and fertility. In places, small wet areas need artificial drainage. Diversion terraces are needed in places to divert runoff from adjacent slopes. Capability unit IIw-7.

Pope Series

The Pope series consists of deep, well-drained soils on flood plains along the smaller streams throughout the survey area, but mostly in the central and eastern parts of the survey area. These soils formed in acid alluvial material washed from soils on uplands that are underlain by sandstone, siltstone, and shale. They are flooded at occasional to frequent intervals. Slopes range from 0 to 5 percent.

In a representative profile in a pasture the surface layer is dark-brown fine sandy loam about 7 inches thick. The subsoil, about 25 inches thick, is very friable fine sandy loam. The upper 8 inches is dark yellowish brown, and the lower 17 inches is dark brown. Below the subsoil is brown fine sandy loam that contains thin, discontinuous layers of silty and sandy material and a few pebbles.

Pope soils have moderate to high available moisture capacity and moderately rapid permeability. Natural fertility is moderate.

These soils are easy to work and are suited to crops, hay, and pasture. There is a slight to moderate risk that crops will be damaged by flood water.

Representative profile of Pope fine sandy loam in a pasture field north of Cirtsville, in Raleigh County:

Ap—0 to 7 inches, dark-brown (10YR 4/3) fine sandy loam; weak, very fine, granular structure; very friable; many roots; medium acid; clear, wavy boundary.

B21—7 to 15 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; weak, fine, subangular blocky structure; very friable; many roots; very strongly acid; abrupt, wavy boundary.

B22—15 to 32 inches, dark-brown (10YR 4/3) fine sandy loam; weak, fine and medium, subangular blocky structure; very friable; few roots; very strongly acid; clear, wavy boundary.

C—32 to 50 inches, brown (10YR 4/3) fine sandy loam; single grained; very friable to loose; thin, discontinuous layers of stratified silty and sandy material and a few pebbles; very strongly acid.

Depth to bedrock is more than 4 feet. Depth to thin, discontinuous layers of stratified material ranges from 30 to 42 inches. Natural reaction in the B and C horizons is very strongly acid to strongly acid.

The B horizon ranges from fine sandy loam to loam. It is dark yellowish brown to yellowish brown or dark brown. The C horizon contains gravel in places.

Pope soils are next to the moderately well drained Philo soils, the poorly drained Atkins soils, and the well drained Chavies soils. They are better drained than either Philo or Atkins soils, and they flood more frequently and have a less developed B horizon than Chavies soils.

Pope fine sandy loam (Po).—This is the only Pope soil mapped in the survey area. It is nearly level. Included in mapping were small areas of Philo and Atkins soils and small areas of soils having a texture of loamy sand.

This Pope soil is suited to all crops commonly grown in the two counties. Continuous row crops can be grown, but a cover crop is needed to protect the soil from scouring during seasonal flooding. Working crop residue into the soil improves tilth and fertility. Diversion terraces are needed in places to divert runoff from adjacent slopes. Capability unit IIw-6.

Rayne Series

The Rayne series consists of deep, well-drained soils on smooth ridgetops and benches in the eastern and central parts of the survey area. These soils formed in acid material weathered from shale, siltstone, and some sandstone. Slopes range from 3 to 20 percent.

In a representative profile in a wooded area the surface layer is very dark grayish-brown silt loam about 3 inches thick underlain by very friable, brown silt loam about 7 inches thick. The subsoil extends to a depth of 45 inches. The upper 9 inches is friable, yellowish-brown heavy silt loam. The next 14 inches is friable to firm, yellowish-brown silty clay loam. The lower part of the subsoil extends to soft sandstone bedrock and is friable to firm, light yellowish-brown channery light clay loam.

Rayne soils have moderate to high available moisture capacity and moderate permeability. Natural fertility is moderate.

These soils are easy to work and are suited to crops, hay, and pasture.

Representative profile of Rayne silt loam, 3 to 10 percent slopes, in a wooded area east of Layland, in Fayette County:

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam, strong, fine, granular structure; very friable; very strongly acid; clear, irregular boundary.

A2—3 to 10 inches, brown (10YR 4/3) silt loam; moderate, fine and medium, granular structure; very friable; very strongly acid; clear, irregular boundary.

B21t—10 to 19 inches, yellowish-brown (10YR 5/6) heavy silt loam; moderate, fine, subangular blocky structure; thin, discontinuous clay films; friable, strongly acid; gradual, wavy boundary.

B22t—19 to 33 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium and fine, subangular blocky structure; friable to firm; few clay films; 5 percent sandstone fragments; very strongly acid; clear, wavy boundary.

B3—33 to 45 inches, light yellowish-brown (10YR 6/4) channery light clay loam; weak, fine and medium, subangular blocky structure; friable to firm; 40 percent sandstone fragments; very strongly acid; gradual, wavy boundary.

R—45 inches, soft gray sandstone.

Depth to bedrock ranges from 42 to 50 inches. The upper part of the solum is generally free of coarse fragments, but coarse fragments make up as much as 40 percent of the lower part of the solum. Natural reaction is strongly acid to very strongly acid throughout the profile.

The B horizon ranges from silty clay loam to heavy silt loam or channery phases of these. It is light yellowish brown to strong brown.

On smooth ridges and benches, Rayne soils are near the well drained Gilpin and Muskingum soils and the moderately well drained Wharton soils. Rayne soils in places are near the well-drained Clymer and Dekalb soils. Rayne soils are siltier than Clymer or Dekalb soils; are deeper than either Dekalb, Muskingum, or Gilpin soils; and have a less clayey B horizon than Wharton soils.

Rayne silt loam, 3 to 10 percent slopes (RaB).—This soil has the profile described as representative of the series. Included in mapping were small areas of Wharton soils and areas of soils that are sandy clay loam in the lower part of the subsoil.

This Rayne soil is suited to all crops commonly grown in the two counties. The hazard of erosion is moderate in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Capability unit IIe-4.

Rayne silt loam, 10 to 20 percent slopes (RaC).—This soil has a profile similar to the one described as representative of the series, but it is shallower over bedrock. Included in mapping were small areas of Gilpin, Clymer, and Dekalb soils.

This soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces on long slopes are also helpful in controlling soil and water losses. Natural drainageways need to be maintained in sod. Capability unit IIIe-4.

Shelocta Series

The Shelocta series consists of deep, well-drained soils on foot slopes, mostly in the western part of the survey

area. These soils formed in acid colluvium weathered from soils on uplands that are underlain by shale, siltstone, and sandstone. Slopes range from 10 to 40 percent. Both very stony and nonstony units are mapped in the survey area.

In a representative profile in an old field the surface layer is dark grayish-brown silt loam about 8 inches thick. The upper part of the subsoil, about 7 inches thick, is friable, brown silt loam. The next layer is friable to firm, strong-brown channery silty clay loam to a depth of 37 inches. The lower part of the subsoil, about 7 inches thick, is firm, strong-brown channery heavy silt loam. Below the subsoil is firm, strong-brown channery silt loam to channery loam.

Shelocta soils have moderate to high available moisture capacity and moderate permeability. Natural fertility is moderate.

The nonstony Shelocta soils are suited to crops, hay, and pasture. Trees grow well on Shelocta soils, and most very stony areas are wooded.

The very stony Shelocta soils are mapped in complex with the very stony Ernest soils in the survey area.

Representative profile of Shelocta silt loam, 10 to 20 percent slopes, in an old field north of Naoma, in Raleigh County:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; very friable; many roots; 10 percent sandstone fragments; medium acid; clear, wavy boundary.

B1—8 to 15 inches, brown (7.5YR 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; 10 percent sandstone fragments; medium acid; clear, wavy boundary.

B21t—15 to 26 inches, strong-brown (7.5YR 5/6) channery silty clay loam; moderate, medium, subangular blocky structure; friable; common roots; thin, discontinuous clay films; 15 percent coarse fragments; strongly acid; clear, wavy boundary.

B22t—26 to 37 inches, strong-brown (7.5YR 5/6) channery silty clay loam; moderate, fine and medium, subangular blocky structure; firm; few yellowish-red (5YR 4/6) ped faces; thin, discontinuous clay films; few mica flakes; 20 percent sandstone fragments; strongly acid; gradual, wavy boundary.

B3t—37 to 44 inches, strong-brown (7.5YR 5/6) channery heavy silt loam; weak, fine and medium, subangular blocky structure; firm; thin, discontinuous clay films; few yellowish-red (5YR 4/6) ped faces; weak; few mica flakes; 25 percent sandstone fragments; strongly acid; gradual, wavy boundary.

C—44 to 60 inches, strong-brown (7.5YR 5/6) channery silt loam to channery loam; massive; firm; common yellowish-red (5YR 4/6) ped faces; few mica flakes; 40 percent sandstone fragments; strongly acid.

Depth to bedrock is more than 4 feet. Coarse fragments make up 10 to 35 percent of the solum. Natural reaction in the B and C horizons is strongly acid to very strongly acid.

The B horizon ranges from silty clay loam to silt loam and is commonly channery. It is brown to strong brown to yellowish brown.

Shelocta soils are next to the moderately well drained Ernest soils. They are better drained and do not have the fragipan that is characteristic of Ernest soils.

Shelocta silt loam, 10 to 20 percent slopes (ShC).—This soil has the profile described as representative of the series. Included in mapping were small areas of Ernest soils and small areas of soils having a surface layer of loam or channery silt loam.

This soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces are needed in places to divert water from hillsides. Capability unit IIIe-4.

Shelocta silt loam, 20 to 30 percent slopes (ShD).—This soil contains more coarse fragments than the one described as representative of the series. Included in mapping were small areas of Ernest soils and small areas of soils having a surface layer of loam or channery silt loam.

This soil is suited to all crops commonly grown in the two counties. The hazard of erosion is very severe in unprotected areas. Minimum tillage, contour stripcropping, and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces are needed in places to divert water from adjacent hillsides. Capability unit IVe-3.

Shelocta silt loam, 30 to 40 percent slopes (ShE).—This soil contains more stone fragments than the one described as representative of the series. Included in mapping were small areas of Muskingum soils and small areas where stones or flagstones are on the surface.

The slopes make this soil unsuited to cultivated crops. It is better suited to pasture than to other uses, and grasses grow well on it. Good pasture management is needed to control soil and water losses and maintain fertility. Capability unit VIe-2.

Steep Rock Land

Steep rock land (Sr) consists of very steep, massive, outcropping sandstone ledges and vertical sandstone cliffs 10 to 50 feet or more high. Very large boulders have accumulated at the base of many of the cliffs. This land is most extensive in the New River gorge, but also is in narrow bands on mountain ridges throughout the survey area.

Included with this unit in mapping were areas of the moderately steep to very steep, very stony Dekalb and Gilpin soils.

Essentially all of this land is wooded. Most trees are of low value. Oak and related hardwoods make fair to good growth on the included areas of the very stony Dekalb and Gilpin soils.

This land generally is not suitable for commercial production of trees. It is suitable for growing trees noncommercially, for watershed, and as wildlife habitat. It also has esthetic value and is useful for landmarks. Capability unit VIIIs-1.

Strip Mine Spoil

Strip mine spoil (St) consists of areas where coal has been strip mined. Strip mining has been practiced extensively throughout the two counties, but mostly in areas of Dekalb, Gilpin, and Muskingum soils.

In strip mining operations the soil material and rock overburden that cover the coal beds are first moved to one side. During this process, the soil material becomes mixed with shale, sandstone, and carbonaceous shale and is deposited on high mounds. These mounds are

continuous and generally are on the contour around hillsides. A high wall remains on the upper part of the slope above the coal seam. The last cut, where the coal has been removed, remains as a channel through the coal until it is filled by slumping from the high wall or by material from the last spoil bank.

Some areas have been leveled, filling the channel and covering the coal face. This regrading has reduced the slopes on the strips, but a vertical high wall of 20 to 50 feet and a very steep outer slope remain. This outer slope is usually droughty, stony, and subject to severe erosion.

Revegetation is often very difficult because of erosion, low pH values, stoniness, and poor moisture-holding capacity of the material. Older strips were left to be revegetated naturally by such species as black birch, aspen, sumac, and other trees, weeds, and vines. More recently, adapted trees, shrubs, and grasses and legumes have been planted on some areas. Because of its variability, this land is not classified as to land capability. It needs onsite inspection and testing to determine proper revegetation and stabilization measures.

Summers Series

The Summers series consists of moderately deep, well-drained soils on broad mountain ridges at elevations higher than 3,000 feet. These soils formed in acid material weathered from sandstone and contain many coarse fragments. Slopes range from 3 to 10 percent.

In a representative profile in a wooded area the surface layer is loam about 14 inches thick. It is black in the upper part and very dark grayish brown in the lower part. The subsoil is about 15 inches thick. The upper 8 inches is friable, dark-brown channery fine sandy loam. The lower 7 inches is friable, dark-brown very channery sandy loam. Below this is friable, yellowish-brown very channery sandy loam that extends to soft sandstone bedrock at a depth of 33 inches.

Summers soils have moderate to low available moisture capacity and moderately rapid permeability. Natural fertility is moderate.

These soils are suited to crops, hay, and pasture. Permanent pasture does not grow well on these somewhat droughty soils.

Representative profile of Summers loam, 3 to 10 percent slopes, in a harvested wooded area 1½ miles southeast of Danese on Walnut Ridge, in Fayette County:

AO—1 inch to 0, black, rotted leaves.

A1—0 to 9 inches, black (10YR 2/1) loam; strong, fine, granular structure; loose; many roots; 15 percent sandstone fragments; very strongly acid; abrupt, irregular boundary.

A12—9 to 14 inches, very dark grayish-brown (10YR 3/2) loam; moderate, fine, granular structure; very friable; many roots; 20 percent root hole fillings of dark brown (10YR 2/2); 15 percent sandstone fragments; very strongly acid; clear, wavy boundary.

B2—14 to 22 inches, dark-brown (7.5YR 4/4) channery fine sandy loam; weak, fine, subangular blocky structure; friable; 35 percent sandstone fragments; very strongly acid; gradual, wavy boundary.

B3—22 to 29 inches, dark-brown (7.5YR 4/4) very channery sandy loam; weak, fine, subangular blocky structure; friable; 60 percent sandstone fragments; very strongly acid; clear, irregular boundary.

C—29 to 33 inches, yellowish-brown (10YR 5/4) very channery sandy loam; massive to very weak, fine, subangular blocky structure; friable; 70 percent sandstone fragments; very strongly acid; clear, irregular boundary.

R—33 inches, soft sandstone.

Depth to bedrock ranges from 20 to 34 inches. Coarse fragments make up more than 35 percent of the profile. The C horizon is absent in some profiles. Natural reaction is very strongly acid to strongly acid throughout the profile.

The B horizon ranges from loam to sandy loam and is commonly channery or very channery. It is dark brown to dark yellowish brown. Coarse fragments make up 20 to 60 percent of this horizon.

Summers soils are mostly next to the well-drained Dekalb soils and, to a lesser extent, the well-drained Gilpin soils. They have a thicker dark-colored surface layer than either Dekalb or Gilpin soils. They are sandier than Gilpin soils.

Summers loam, 3 to 10 percent slopes (SuB).—This is the only Summers soil mapped in the survey area. Included in mapping were small areas where flagstones or an occasional larger stone is on the surface. Also included were small areas of steeper soils, small areas of soils having a surface layer of fine sandy loam, and small areas of Dekalb soils.

This Summers soil is suited to most crops grown in the two counties. In cultivated areas, contour stripcropping helps to control erosion, limit water losses, and maintain good tilth and the content of organic matter. Capability unit IIe-12.

Wharton Series

The Wharton series consists of deep, moderately well drained soils on smooth ridgetops and benches, commonly in close proximity to a coal seam. These soils formed in acid material weathered from clay shale. Slopes range from 3 to 20 percent.

In a representative profile in an old field the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsoil is about 33 inches thick. The upper 6 inches is firm, yellowish-brown silty clay loam. The next 9 inches is firm, plastic and sticky, strong-brown silty clay. Below this is a 5-inch layer of firm, plastic and sticky, light brownish-gray silty clay mottled with strong brown. The lower part of the subsoil is firm, slightly plastic and slightly sticky, light-gray clay. Below the subsoil is firm, plastic and sticky, light-gray clay mottled with strong brown.

Wharton soils have high available moisture capacity. Permeability is slow in the claypan and moderate above the claypan. Natural fertility is moderate.

These soils are suited to crops, hay, and pasture. Because of the seasonal high water table, deep-rooted legumes may not last long.

Representative profile of Wharton silt loam, 3 to 10 percent slopes, in an old field about 2 miles east of Shady Spring, in Raleigh County:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; very friable; common roots; very strongly acid; clear, wavy boundary.

B21t—9 to 15 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate to strong, medium, subangular blocky structure; firm; common roots; thin, discontinuous clay films of grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2); very strongly acid; clear, wavy boundary.

B22t—15 to 24 inches, strong-brown (7.5YR 5/6) silty clay; weak, coarse, prismatic structure parting to strong, coarse, subangular blocky; firm; plastic and sticky;

thin discontinuous clay films of brown (10YR 5/3); very strongly acid; clear, wavy boundary.

B23tg—24 to 29 inches, light brownish-gray (2.5YR 6/2) silty clay; many, fine, strong-brown (7.5YR 5/8) mottles; moderate, coarse, subangular blocky structure; firm; plastic and sticky; thin, discontinuous clay films of brown (10YR 5/3); very strongly acid; gradual, wavy boundary.

B24tg—29 to 42 inches, light-gray (N 6/0) clay; many, fine, strong-brown (7.5YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm; slightly plastic and slightly sticky; thin, discontinuous clay films of light brownish gray (2.5Y 6/2); few small shale fragments of reddish brown (5YR 5/4); very strongly acid; gradual, wavy boundary.

Cg—42 to 60 inches, light-gray (N 6/0) clay; many, fine, strong-brown (7.5YR 5/8) mottles; massive to weak, coarse, subangular blocky structure; firm; plastic and sticky; thin, discontinuous clay coatings of dark gray (N 4/0); very strongly acid.

Depth to bedrock is more than 4 feet. Depth to low-chroma mottles ranges from 16 to 26 inches. Natural reaction is very strongly acid to extremely acid throughout the profile.

The upper part of the B horizon ranges from yellowish brown to strong brown. The solum is generally almost free of coarse fragments, but in places coarse fragments make up 10 percent of the solum.

Wharton soils are near the well-drained Gilpin, Muskingum, Rayne, Clymer, and Dekalb soils. They have a more clayey B horizon and are less well drained than those soils.

Wharton silt loam, 3 to 10 percent slopes (WhB).—This soil has the profile described as representative of the series. Included in mapping were small areas of soils having a channery surface layer, small areas of soils that are shallower over bedrock than the one defined as representative of the Wharton series, and small areas of Rayne soils.

This Wharton soil is suited to all crops commonly grown in the two counties. The hazard of erosion is moderate in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Capability unit IIe–13.

Wharton silt loam, 10 to 20 percent slopes (WhC).—This soil is generally shallower over bedrock than the one described as representative of the series. Included in mapping were other small areas of soils that are shallower over bedrock than the one defined as representative of the Wharton series, and small areas of Gilpin and Muskingum soils.

This Wharton soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, contour stripcropping and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Natural drainageways need to be kept in sod. Capability unit IIIe–13.

Wharton silt loam, 10 to 20 percent slopes, severely eroded (WhC3).—Erosion has removed most of the original surface layer from this soil. Gullies are present in places. This soil is shallower over bedrock than the one described as representative of the series. Included in mapping were other small areas of soils that are shallower over bedrock than the one defined as representative of the series, small areas of soils having a channery surface layer, and small areas of Gilpin soils.

This Wharton soil is suited to all crops commonly grown in the two counties. The hazard of erosion is severe in unprotected areas. In cultivated areas, minimum tillage, contour stripcropping, and cropping systems that include hay in the cropping sequence help to control erosion and maintain good tilth and the content of organic matter. Diversion terraces are needed in places to divert water from upper slopes. Natural drainageways need to be kept in sod. Capability unit IVe–9.

Use and Management of the Soils

The dominant problems of use and management do not differ greatly throughout the two counties. Upland soils make up most of the acreage. These soils are moderately deep or deep, and most are moderately steep to very steep. They are mostly moderate or low in natural fertility. Except for two soils on the flood plains, all untreated soils in the two counties need lime for good growth of most crops. The main concerns of use and management are controlling erosion and building and maintaining fertility. In addition, artificial drainage is needed on some of the wet soils.

In the following pages, the use and management of the soils are described. First, the grouping of soils according to their capability is explained, and the capability units in Fayette and Raleigh Counties are described briefly in an outline. Then, estimated acre yields are given for the principal crops under two levels of management. Next are discussions of the use of soils as woodland, for wildlife, and in engineering. Finally, information is given about the use of soils for town and country planning.

For detailed discussion of use and management of the soils for cropland, pasture, and woodland, the reader should refer to the descriptions of the mapping units in the section "Descriptions of the Soils."

Capability Grouping

The capability classification is a grouping that shows, in a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, the subclass, and the unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be as many as four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the

soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the country, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it are subject to little or no erosion but have other limitations that restrict their use largely to pasture, range, woodland, or wildlife habitat.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Management of the soils in Fayette and Raleigh Counties for crop and pasture plants is discussed by mapping units in the section "Descriptions of the Soils." Capability units are generally identified by numbers assigned locally, for example, IIe-10 or IIIe-4. These numbers are not consecutive in Fayette and Raleigh Counties, because not all of the capability units used in West Virginia occur in these counties. The soils in each capability unit have about the same limitations and require about the same treatment.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system, and the subclasses and units in these counties, are described briefly in the list that follows. Those desiring more detailed information about the soils in the capability units should refer to the section "Descriptions of the Soils."

Class I.—Soils that have few limitations that restrict their use.
- Unit I-6; Deep, well-drained, nearly level soils on flood plains; infrequently flooded.

Class II.—Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.
- Subclass IIe: Gently sloping soils that have moderate risk of erosion and that require protection if cultivated.
  - Unit IIe-4: Deep, well-drained, gently sloping soils that formed in material weathered from shale, siltstone, and sandstone, and soils that formed in colluvium weathered from soils underlain by red and gray shale and siltstone.
  - Unit IIe-10: Moderately deep, well-drained, gently sloping soils that formed in acid material weathered from shale, siltstone, and sandstone.
  - Unit IIe-12: Moderately deep, well-drained, gently sloping soils that formed in material weathered from sandstone.
  - Unit IIe-13: Deep, moderately well drained, gently sloping soils that have a fragipan or clayey layer in the subsoil.
- Subclass IIw: Soils that have slightly impeded drainage that makes them seasonally wet and that restricts their use for some crops.
  - Unit IIw-1: Deep, moderately well drained, nearly level soils that have a fragipan in the subsoil.
  - Unit IIw-6: Deep, well-drained, nearly level soils on flood plains; occasionally to frequently flooded.
  - Unit IIw-7: Deep, moderately well drained, nearly level soils on flood plains; occasionally to frequently flooded.

Class III.—Soils that have severe limitations that reduce the choice of plants, require special conservation practices, or both.
- Subclass IIIe: Strongly sloping soils that erode if not protected.
  - Unit IIIe-4: Deep, well-drained, strongly sloping soils that formed in material weathered from shale, siltstone, and sandstone, and soils that formed in colluvium weathered from soils underlain by red and gray shale and siltstone.
  - Unit IIIe-10: Moderately deep, well-drained, strongly sloping soils that formed in material weathered from gray shale, siltstone, and sandstone and from red shale and siltstone.
  - Unit IIIe-12: Moderately deep, well-drained, strongly sloping soils that formed in material weathered from sandstone.
  - Unit IIIe-13: Deep, moderately well drained, strongly sloping soils that have a fragipan or clayey layer in the subsoil.
- Subclass IIIw: Soils seriously limited by excess water.
  - Unit IIIw-1: Deep, poorly drained, nearly level soils on flood plains; occasionally to frequently flooded.
- Subclass IIIs: Soils severely limited by droughtiness.
  - Unit IIIs-6: Gravelly alluvial materials on flood plains.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.
- Subclass IVe: Strongly sloping to moderately steep soils that are subject to severe erosion if not protected, or that are severely eroded.
  - Unit IVe-3: Moderately deep and deep, well-drained, strongly sloping and moderately steep soils that formed in acid material weathered from gray shale, siltstone, and sandstone and in colluvium from these soils, and soils that formed in material weathered from red shale and siltstone.
  - Unit IVe-5: Moderately deep, well-drained, moderately steep soils that formed in material weathered from sandstone.
  - Unit IVe-9: Deep, moderately well drained, strongly sloping soils that have a clayey layer in the subsoil.
- Subclass IVw: Soils severely limited by excess water.
  - Unit IVw-1: Deep, very poorly drained, nearly level and gently sloping soils that formed

in colluvium weathered from upland soils underlain by gray shale, siltstone, and sandstone.

Unit IVw–5: Deep, poorly drained, mostly gently sloping soils that formed in colluvium weathered from upland soils underlain by gray shale, siltstone, and sandstone.

Class V.—Soils that are not likely to erode but that have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture or range, wooded areas, or wildlife habitat. (None in Fayette and Raleigh Counties.)

Class VI.—Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture or range, wooded areas, or wildlife habitat.

Subclass VIe: Soils that have a severe hazard of erosion if not protected, or that are severely eroded.

Unit VIe–2: Moderately deep and deep, well-drained, moderately steep and steep soils that formed in acid material weathered from gray shale, siltstone, and sandstone and in colluvium from these soils, and from soils that formed in red shale and siltstone.

Subclass VIw: Soils very severely limited by excess water.

Unit VIw–1: Mostly nearly level soils on flood plains that are frequently flooded.

Subclass VIs: Soils that are severely limited by stones on the surface.

Unit VIs–2: Deep and moderately deep, gently sloping to strongly sloping, very stony soils on uplands and foot slopes.

Class VII.—Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, wooded areas, or wildlife habitat.

Subclass VIIe: Soils subject to severe erosion if not protected, or soils that are severely eroded.

Unit VIIe–2: Moderately deep, well-drained, steep to very steep soils that formed in material weathered from gray shale, siltstone, and sandstone and from red shale and siltstone.

Subclass VIIs: Soils that are very severely limited by stones and slopes.

Unit VIIs–2: Moderately deep, well-drained, very stony soils that formed in material weathered from gray shale, siltstone, and sandstone and from red shale and siltstone.

Class VIII.—Land that is unsuitable for the commercial production of crops, for pasture, or for trees, but is valuable as wildlife habitat and recreational areas.

Subclass VIIIs: Rock or soil material that has little potential for production of vegetation.

Unit VIIIs–1: Very steep rock land that is useful mostly for esthetic purposes and for landmarks.

Estimated Yields

In table 2 are listed estimated yields for the major grain and forage crops and for permanent pasture grown on the soils of Fayette and Raleigh Counties. Yields are estimated for a 10-year period at two levels of management and are shown in columns A and B. Yields in columns A are estimated for the ordinary management now used by farmers. Those in columns B are estimated for improved management, including use of suitable kinds and amounts of fertilizer. New techniques may increase the average yields to higher than those shown, but the relative response of the different soils is not likely to change much.

Known crop yields, where available from farmers or others, were used to estimate the yield of columns A. Data from trials made by the West Virginia University Agricultural Experiment Station on known soils and on information from farmers who have kept records for crops on various soils were also used. Where information was lacking, present yields were estimated and the properties of the soils were considered.

The estimated yields in columns B are based on the results from corn trials on the soils in the two counties and on actual experience by farmers who used improved management. Where data were lacking, estimates were made after considering soil properties and local knowledge. These yields represent about what can be expected from management that is based on present knowledge and on methods that are practical. The management needed to obtain these yields consists of liming to the pH required for the crop, fertilizing according to need as determined by soil tests, using good rotations, and using necessary soil and water conservation practices, including drainage where necessary. Generally, manure is not used extensively, except on dairy farms. The management needed to obtain the yields estimated for pasture includes the use of enough fertilizer to provide phosphate and potash where needed and enough lime to maintain a pH of 6.0 to 6.5. Irrigation was not considered.

The response to improved management is best on Ashton and similar soils that are deep and have favorable slopes and texture and high available moisture capacity. On Brinkerton and similar soils that are moderate in natural fertility but have unfavorable physical properties, the response to improved management is limited. Under improved management, yields of hay and pasture increase more than yields of corn and small grain, because ordinary practices commonly used to produce corn and small grain are already closer to the improved level of management than those for hay and pasture.

Use of the Soils for Woodland [2]

Woodland in the survey area amounts to nearly 668,000 acres, or 83 percent of the total land area. All except 23,000 acres is privately owned, and only 4,600 acres is noncommercial forest (*4*). Woodland tracts vary from small farm woodlots to large corporate ownerships of several thousand acres. The largest woodland tracts are in the western one-third of the survey area.

The most common forest types, or natural associations of tree species, and their percent of the wooded area, are

[2] ROSS H. MELLINGER, woodland conservationist, assisted in preparing this section.

TABLE 2.—*Estimated acre yields of principal crops*

[Yields in columns A are those expected under ordinary management; those in columns B are expected under improved management. Absence of yields indicates crop is not well suited at specified level of management. Soils that are severely limited by steep slopes, stoniness, or very severe erosion are not suited to crops and do not appear in this table]

Soil	Corn		Oats		Hay: Clover-grass		Hay: Alfalfa-grass		Permanent bluegrass pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Alluvial land									60	110
Ashton fine sandy loam	60	135	40	80	2.0	3.5	3.0	5.0	100	160
Atkins silt loam		90		60	1.0	3.0			50	140
Brinkerton silt loam	40	90	25	60	1.0	2.5			50	115
Calvin-Gilpin silt loams, 10 to 20 percent slopes [2]	45	80	30	60	1.5	2.7	1.7	3.2	60	125
Calvin-Gilpin silt loams, 20 to 30 percent slopes [2]	40	70	30	55	1.5	2.2	1.5	3.0	50	110
Calvin-Gilpin silt loams, 20 to 30 percent slopes, severely eroded [2]									40	95
Calvin-Gilpin silt loams, 30 to 40 percent slopes [2]									40	90
Calvin-Gilpin very stony silt loams, 10 to 20 percent slopes [2]									60	100
Chavies fine sandy loam	50	120	40	75	1.5	3.2	2.0	4.2	75	160
Clymer loam, 3 to 10 percent slopes	40	110	35	70	1.5	3.5	1.7	4.5	60	160
Clymer loam, 10 to 20 percent slopes	35	105	30	65	1.5	3.0	1.5	4.0	50	135
Cookport loam, 2 to 8 percent slopes	35	100	30	65	1.5	3.0	1.5	3.5	60	140
Dekalb fine sandy loam, 3 to 10 percent slopes	30	75	25	60	1.5	3.0	1.5	3.5	40	115
Dekalb fine sandy loam, 10 to 20 percent slopes	25	70	20	55	1.5	2.7	1.5	3.2	35	105
Dekalb channery loam, 20 to 30 percent slopes	20	65	20	50	1.2	2.2	1.2	3.0	30	100
Dekalb channery loam, 30 to 40 percent slopes									30	90
Ernest silt loam, 3 to 10 percent slopes	40	100	35	65	1.5	3.0	1.5	3.5	75	150
Ernest silt loam, 10 to 20 percent slopes	35	90	35	60	1.5	2.8	1.5	3.2	70	145
Ernest and Shelocta very stony silt loams, 5 to 20 percent slopes [2]									60	115
Gilpin silt loam, 3 to 10 percent slopes	40	90	35	65	1.5	3.0	2.0	3.5	60	135
Gilpin silt loam, 10 to 20 percent slopes	40	85	35	60	1.5	2.7	1.7	3.2	60	130
Gilpin silt loam, 10 to 20 percent slopes, severely eroded	30	80	20	55	1.2	2.5	1.5	3.0	50	120
Gilpin silt loam, 20 to 30 percent slopes	30	80	25	55	1.2	2.5	1.5	3.0	50	120
Gilpin silt loam, 20 to 30 percent slopes, severely eroded									45	100
Gilpin silt loam, 30 to 40 percent slopes									40	100
Gravelly alluvial land	40	70	35	55	1.0	2.5	1.5	3.0	50	110
Landes fine sandy loam	50	130	40	80	2.0	3.5	2.2	4.5	80	165
Lickdale silt loam		80		50	1.0	2.5			40	115
Meckesville silt loam, 3 to 10 percent slopes	60	110	35	70	2.0	3.2	2.2	4.2	80	150
Meckesville silt loam, 10 to 20 percent slopes	55	105	35	65	1.7	3.0	2.0	4.0	70	140
Meckesville very stony silt loam, 10 to 20 percent slopes									65	120
Monongahela silt loam, 0 to 3 percent slopes	30	100	30	65	1.5	3.0	2.7	3.5	45	130
Monongahela silt loam, 3 to 10 percent slopes	35	100	35	65	1.5	3.0	3.0	3.5	50	130
Muskingum silt loam, 10 to 20 percent slopes	45	85	35	60	1.5	2.7	2.0	3.2	70	130
Muskingum silt loam, 10 to 20 percent slopes, severely eroded	40	80	20	55	1.5	2.5	1.7	3.0	60	125
Muskingum silt loam, 20 to 30 percent slopes	40	80	25	55	1.5	2.5	1.5	3.0	50	120
Muskingum silt loam, 20 to 30 percent slopes, severely eroded									45	100
Muskingum silt loam, 30 to 40 percent slopes									40	95
Philo silt loam	50	130	30	80	1.7	3.5	1.5	4.5	80	160
Pope fine sandy loam	50	135	35	80	1.7	3.5	2.0	4.5	70	155
Rayne silt loam, 3 to 10 percent slopes	45	110	35	75	1.7	3.5	2.0	4.5	60	160
Rayne silt loam, 10 to 20 percent slopes	40	100	30	70	1.5	3.2	1.7	4.2	55	150
Shelocta silt loam, 10 to 20 percent slopes	60	110	30	70	2.0	3.5	2.2	4.5	70	160
Shelocta silt loam, 20 to 30 percent slopes	50	100	30	65	1.7	3.0	2.0	4.0	65	150
Shelocta silt loam, 30 to 40 percent slopes									60	130
Summers loam, 3 to 10 percent slopes	30	65	20	55	1.2	2.7	1.2	3.2	40	100
Wharton silt loam, 3 to 10 percent slopes	40	90	35	65	1.7	3.0	1.5	3.5	50	135
Wharton silt loam, 10 to 20 percent slopes	40	80	35	60	1.2	3.0	1.5	3.5	50	135
Wharton silt loam, 10 to 20 percent slopes, severely eroded	25	70	20	55	1.0	2.5	1.0	3.0	45	115

[1] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days.

[2] Yields not significantly different for the two soils in this unit.

the oak-hickory type, about 73 percent; the maple-beech-birch type, about 18 percent; other hardwood types, about 6 percent; and pine types, about 3 percent (*4*). Most of the maple-beech-birch type occurs at the higher elevations north of U.S. Highway No. 60. Christmas trees also are grown in the two counties (fig. 6).

The large acreage of woodland located on very steep slopes, the favorable climate, and the soils that are suited to trees indicate that producing wood crop will continue to be important in the survey area.

Soil properties have a strong influence on occurrence of tree species, tree growth, and woodland management. Differences in soil depth and in texture, for example, cause differences in available moisture capacity and thereby influence the occurrence of species and the rate at which trees grow. Other features, such as steepness of slope, stoniness, rockiness, or a clayey subsoil, also affect woodland management. Aspect, or the direction in which a sloping soil faces, can also affect tree growth and management.

The soils of the survey area are rated for woodland suitability in table 3. Woodland suitability subclass, aspect, site index, some of the hazards and limitations that affect woodland management, and species suitability are shown in the table and explained in the following paragraphs.

On some sloping soils, generally those steeper than 20 percent, site index varies because of aspect. Such soils are shown in table 3 as "North" or "South" aspects. North aspects are those that face in any compass direction clockwise from N. 45° W. to S. 45° E. South aspects are those that face in any compass direction clockwise from S. 45° E. to N. 45° W. Aspects for any area of sloping land can be determined from the photographic background of the soil map, from a stereo pair of plain aerial photos, from a topographic map of the area, or from compass readings taken on site. Aspect also affects the occurrence of tree species and some management hazards.

Site index is shown as a range for the common species normally found on a given soil and for which yield information is available. Productivity of soils for forest trees is measured by site index. The site index is the average height, in feet, of the dominant and codominant trees of a species or group of species in a well-stocked stand at 50 years of age. For example, if the site index for upland oaks is 70 on a given soil, this means that the dominant and codominant trees in a stand of oaks on that soil have an average height of 70 feet when the trees are 50 years old. By referring to table 4, the reader can translate these site index ratings into potential yields of wood for each soil.

Figure 6.—**Poorly pruned Christmas trees growing on Dekalb channery loam, 20 to 30 percent slopes.**

TABLE 3.—*Woodland*

Soil series and map symbols	Woodland suitability class	Aspect	Productivity		Erosion hazard	Management concerns	
			Species	Site index		Equipment restrictions	Seedling mortality
Alluvial land: Ad	3w		Yellow-poplar Upland oaks	75–85 65–75	Slight	Severe	Moderate
Ashton: As	1o		Yellow-poplar Upland oaks	95+ 85+	Slight	Slight	Slight
Atkins: At	1w		Pin oak	85+	Slight	Severe	Severe
Brinkerton: Br	2w		Upland oaks	75–85	Slight	Severe	Severe
Calvin-Gilpin:							
CaC, CgC	3f		Upland oaks	65–75	Slight	Slight	Slight
CaD, CaD3, CgE	2f	North	Upland oaks Yellow-poplar	75–85 85–95	Moderate	Moderate	Slight
	3f	South	Upland oaks Virginia pine	65–75 65–75	Moderate	Moderate	Moderate
CaE, CaE3, CaF, CaF3, CgF.	2f	North	Upland oaks	75–85	Severe	Severe	Slight
	3f	South	Upland oaks Virginia pine	65–75 65–75	Severe	Severe	Moderate
Chavies: Ch	2o		Yellow-poplar	85–95	Slight	Slight	Slight
Clymer: ClB, ClC	2o		Upland oaks	75–85	Slight	Slight	Slight
Cookport: CpB	2w		Upland oaks	70–80	Slight	Moderate	Slight
Dekalb:							
DbB	4f		Upland oaks	60–70	Slight	Slight	Slight
DbC, DsC	3f		Upland oaks	65–75	Slight	Slight	Slight
DcD, DsE	2f	North	Upland oaks Yellow-poplar	75–85 85–95	Slight	Moderate	Slight
	3f	South	Upland oaks	65–75	Slight	Moderate	Moderate

See footnotes at end of table.

suitability of soils

Management concerns—Continued			Species suitability [1]		
Plant competition		Windthrow hazard	To favor in existing stands	To favor in planting [2]	For Christmas trees [3]
Conifers	Hardwoods				
Severe	Moderate	Slight	Yellow-poplar, upland oaks, black walnut, sycamore.	Yellow-poplar, white pine, Virginia pine.	Not suitable.
Severe	Moderate	Slight	Yellow-poplar, upland oaks, black walnut, white ash.	Yellow-poplar, black walnut, white pine, Norway spruce.	White pine, Scotch pine, Norway spruce.
Severe	Severe	Slight to moderate.	Pin oak, red maple, sycamore.	White pine, sycamore.	Not suitable.
Severe	Severe	Moderate	Yellow-poplar, red oak, sycamore.	White pine, Virginia pine.	Not suitable.
Moderate	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak, white oak.	White pine, larch, Virginia pine, Norway spruce, black locust.	White pine, Scotch pine.
Moderate	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak, white oak.	White pine, larch, Virginia pine, Norway spruce, black locust.	White pine, Norway spruce, Scotch pine.
Slight	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak, white oak.	White pine, larch, Virginia pine, Norway spruce, black locust.	White pine, Scotch pine.
Moderate	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak.	White pine, red pine, Virginia pine, Japanese larch, yellow-poplar, black locust.	Not suitable.
Slight	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak.	White pine, red pine, Virginia pine, Japanese larch, black locust.	Not suitable.
Severe	Severe	Slight	Yellow-poplar, red oak, black walnut, sycamore, white ash.	Yellow-poplar, black walnut, white pine, Virginia pine, Norway spruce.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, white ash, red oak, black cherry, sugar maple, white pine.	Yellow-poplar, black walnut, white pine, Virginia pine, Norway spruce, red pine.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, red oak, black cherry, sugar maple.	White pine, Virginia pine.	White pine, Scotch pine.
Moderate	Slight	Slight	White pine, Virginia pine, red oak, black oak.	White pine, Virginia pine, red pine, Japanese larch.	Norway spruce, Scotch pine.
Moderate	Slight	Slight	White pine, Virginia pine, red oak, black oak.	White pine, Virginia pine, red pine, Japanese larch.	Norway spruce, Scotch pine.
Severe	Moderate	Slight	White pine, Virginia pine, yellow-poplar, red oak, black cherry.	White pine, red pine, Virginia pine, Norway spruce, yellow-poplar.	White pine, Norway spruce, Scotch pine.
Moderate	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black cherry.	White pine, red pine, Virginia pine, Norway spruce, yellow-poplar.	White pine, Norway spruce, Scotch pine.

TABLE 3.—*Woodland*

Soil series and map symbols	Woodland suitability class	Aspect	Productivity		Erosion hazard	Management concerns	
			Species	Site index		Equipment restrictions	Seedling mortality
Dekalb—Continued DcE, DsF	2f	North	Upland oaks Yellow-poplar	75–85 85–95	Moderate	Severe	Slight
	3f	South	Upland oaks	65–75	Moderate	Severe	Moderate
Ernest: ErB	2w		Yellow-poplar Upland oaks	85–95 75–85	Slight	Moderate	Slight
ErC	2w		Yellow-poplar Upland oaks	85–95 75–85	Moderate	Moderate	Slight
EsC	2w		Yellow-poplar	85–95	Slight	Slight	Slight
EsE	1r	North	Yellow-poplar	95+	Moderate	Moderate	Slight
	2r	South	Yellow-poplar	85–95	Moderate	Moderate	Slight
Gilpin: GlB, GlC, GlC3	3o		Upland oaks	65–75	Slight	Slight	Slight
GlD, GlD3	2r	North	Upland oaks Yellow-poplar	75–85 85–95	Slight	Moderate	Slight
	3r	South	Upland oaks	65–75	Slight	Moderate	Slight
GlE, GlE3, GlF, GlF3	2r	North	Upland oaks Yellow-poplar	75–85 85–95	Moderate	Severe	Slight
	3r	South	Upland oaks	65–75	Moderate	Severe	Slight
Gravelly alluvial land: Gr	3f		Upland oaks	65–75	Slight	Slight	Moderate

See footnotes at end of table.

suitability of soils—Continued

Management concerns—Continued			Species suitability [1]		
Plant competition		Windthrow hazard	To favor in existing stands	To favor in planting [2]	For Christmas trees [3]
Conifers	Hardwoods				
Severe	Moderate	Slight	White pine, Virginia pine, yellow-poplar, red oak, black cherry, sugar maple.	White pine, red pine, Virginia pine, Japanese larch, yellow-poplar, black locust.	Not suitable.
Moderate	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black cherry, sugar maple.	White pine, red pine, Virginia pine, Japanese larch, yellow-poplar, black locust.	Not suitable.
Severe	Moderate	Slight	White pine, black locust, yellow-poplar, red oak, black oak, white oak, black cherry.	White pine, red pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar, black locust.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	White pine, black locust, yellow-poplar, red oak, black oak, white oak, black cherry.	White pine, red pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar, black locust.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	White pine, yellow-poplar, red oak, black oak, sugar maple, white ash.	White pine, red pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar.	Not suitable.
Severe	Moderate	Slight	White pine, yellow-poplar, red oak, black oak, sugar maple, white ash.	White pine, red pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar.	Not suitable.
Severe	Moderate	Slight	White pine, yellow-poplar, red oak, black oak, sugar maple, white ash.	White pine, red pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar.	Not suitable.
Moderate	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak, black cherry, sugar maple.	White pine, red pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar, black locust.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak, black cherry, sugar maple.	White pine, red pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar, black locust.	White pine, Norway spruce, Scotch pine.
Moderate	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak, black cherry, sugar maple.	White pine, red pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar, black locust.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	White pine, Virginia pine, yellow-poplar, red oak, black oak, black cherry, sugar maple.	White pine, red pine, Virginia pine, Japanese larch, yellow-poplar, black locust.	Not suitable.
Moderate	Slight	Slight	White pine, Virginia pine, yellow-poplar, red oak, black cherry, sugar maple.	White pine, red pine, Virginia pine, Japanese larch, yellow-poplar, black locust.	Not suitable.
Moderate	Slight	Slight	Red oak, sycamore, white ash.	White pine, Virginia pine.	Not suitable.

TABLE 3.—*Woodland*

Soil series and map symbols	Woodland suitability class	Aspect	Productivity: Species	Productivity: Site index	Erosion hazard	Management concerns: Equipment restrictions	Management concerns: Seedling mortality
Landes: La	1o		Yellow-poplar	95+	Slight	Slight	Slight
Lickdale: Lc	1w		Pin oak	95+	Slight	Severe	Severe
Made land: Ma. Too variable to be rated.							
Meckesville: McB, McC, MdC	1o		Yellow-poplar Upland oaks	95+ 95+	Slight	Slight	Slight
MdE	1r	North	Yellow-poplar Upland oaks	95+ 85+	Moderate	Moderate	Slight
	2r	South	Upland oaks Yellow-poplar	75–85 85–95	Moderate	Moderate	Slight
Mine dump: Me. Too variable to be rated.							
Monongahela: MgA, MgB	3w		Upland oaks	65–75	Slight	Moderate	Slight
Muskingum: MkC, MkC3	3o		Upland oaks	65–75	Slight	Slight	Slight
MkD, MkD3, MnE	2r	North	Yellow-poplar Upland oaks	85–95 75–85	Slight	Moderate	Slight
	3r	South	Upland oaks	65–75	Slight	Moderate	Slight
MkE, MkE3, MkF, MnF	2r	North	Yellow-poplar Upland oaks	85–95 75–85	Moderate	Severe	Slight
	3r	South	Upland oaks	65–75	Moderate	Severe	Slight
Philo: Ph	1w		Yellow-poplar	95+	Slight	Moderate	Slight
Pope: Po	2o		Yellow-poplar	85–95	Slight	Slight	Slight

See footnotes at end of table.

suitability of soils—Continued

Management concerns—Continued			Species suitability [1]		
Plant competition		Windthrow hazard	To favor in existing stands	To favor in planting [2]	For Christmas trees [3]
Conifers	Hardwoods				
Severe	Severe	Slight	Yellow-poplar, red oak, white ash, black walnut, black locust.	Black walnut, yellow-poplar, black locust, white pine, Virginia pine, Japanese larch, Norway spruce.	White pine, Norway spruce, Scotch pine.
Severe	Severe	Slight to moderate.	Pin oak, sycamore, red maple, silver maple.	White pine, sycamore	Not suitable.
Severe	Moderate	Slight	Yellow-poplar, black walnut, white ash, red oak, white pine, black locust.	White pine, red pine, Norway spruce, yellow-poplar, black walnut.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, black walnut, white ash, red oak, white pine, black locust.	White pine, red pine, Norway spruce, yellow-poplar, black walnut.	Not suitable.
Severe	Moderate	Slight	Yellow-poplar, black walnut, white ash, red oak, white pine, black locust.	White pine, red pine, Norway spruce, yellow-poplar, black walnut.	Not suitable.
Moderate	Slight	Slight	Yellow-poplar, white ash, red oak, white pine, Virginia pine.	White pine, Virginia pine, Japanese larch, Norway spruce.	White pine, Norway spruce, Scotch pine.
Moderate	Slight	Slight	Yellow-poplar, white ash, red oak, black oak, white pine, Virginia pine.	White pine, Virginia pine, Japanese larch, Norway spruce.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, white ash, red oak, black oak, white pine, black walnut.	White pine, Virginia pine, Japanese larch, Norway spruce, black walnut.	White pine, Norway spruce, Scotch pine.
Moderate	Slight	Slight	Yellow-poplar, white ash, red oak, black oak, white pine, black walnut.	White pine, Virginia pine, Japanese larch, Norway spruce, black walnut.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, white ash, red oak, black oak, white pine, black walnut.	White pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar, black cherry, black locust.	Not suitable.
Moderate	Slight	Slight	Yellow-poplar, white ash, red oak, black oak, white pine, black walnut.	White pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar, black cherry, black locust.	Not suitable.
Severe	Moderate	Slight	Yellow-poplar, red oak, white ash, sycamore.	Black locust, white pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, red oak, white ash, sycamore.	Black locust, white pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar, black walnut, red pine.	White pine, Norway spruce, Scotch pine.

TABLE 3.—*Woodland*

Soil series and map symbols	Woodland suitability class	Aspect	Productivity: Species	Productivity: Site index	Erosion hazard	Management concerns: Equipment restrictions	Management concerns: Seedling mortality
Rayne: RaB, RaC	2o		Yellow-poplar	85–95	Slight	Slight	Slight
Shelocta: ShC	1o		Yellow-poplar	95+	Slight	Slight	Slight
ShD, ShE	1r	North	Yellow-poplar	95+	Moderate	Moderate	Slight
	2r	South	Upland oaks	75–85	Moderate	Moderate	Slight
Steep rock land: Sr	3x, 4x, 5x		Upland oaks	50–70	Slight	Severe	Moderate to severe.
Strip mine spoil: St. Too variable to be rated.							
Summers: SuB	3o		Upland oaks	60–70	Slight	Slight	Slight
Wharton: WhB, WhC, WhC3.	2w		Upland oaks	70–80	Slight	Slight	Slight

[1] Species most commonly preferred. They are not listed in order of preference.
[2] Red pine should be limited to elevations of more than 2,000 feet, and Virginia pine of less than 2,500 feet.

suitability of soils—Continued

Management concerns—Continued			Species suitability [1]		
Plant competition		Windthrow hazard	To favor in existing stands	To favor in planting [2]	For Christmas trees [3]
Conifers	Hardwoods				
Severe	Moderate	Slight	Yellow-poplar, black walnut, red oak, black oak, black cherry, white pine.	Yellow-poplar, black walnut, white pine, Virginia pine, red pine, Norway spruce.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, black walnut, red oak, white ash, sugar maple.	Yellow-poplar, black walnut, white pine, Virginia pine, Norway spruce.	White pine, Norway spruce, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, black walnut, red oak, black oak, sugar maple, black locust.	Yellow-poplar, black walnut, white pine, Virginia pine, Norway spruce.	White pine, Norway spruce, Scotch pine.
Moderate	Slight	Slight	Yellow-poplar, black walnut, red oak, black oak, sugar maple, black locust.	Yellow-poplar, black walnut, white pine, Virginia pine, Norway spruce.	White pine, Norway spruce, Scotch pine.
Slight	Slight	Slight to severe.	Oaks, black locust, white pine.	No species suitable	Not suitable.
Moderate	Slight	Slight	Red oak, black oak, white ash, sugar maple, black cherry, white pine.	White pine, Virginia pine, red pine, Japanese larch.	White pine, Scotch pine.
Severe	Moderate	Slight	Yellow-poplar, red oak, black oak, black cherry, sugar maple, black walnut.	White pine, Virginia pine, Japanese larch, Norway spruce, yellow-poplar.	White pine, Norway spruce, Scotch pine.

[3] Species are indicated only on those mapping units suitable for managed plantations of Christmas trees.

TABLE 4.—*Yields per acre from upland oaks, yellow-poplar, and Virginia pine in even-aged, fully stocked natural stands*

[Compiled from USDA Tech. Buls. 560 and 356 and SE. Forest Exp. Sta. Paper 124 (*11, 8, 9*). Dashes indicate that the information does not apply or was not available]

Site index	Age	Upland oaks		Yellow-poplar		Virginia pine
		Bd. ft.[1]	*Cords*[2]	*Bd. ft.*[3]	*Cords*[4]	*Cords*[5]
50	30	350	6.4	--------	--------	[6] 11.0
	40	1,400	12.8	--------	--------	[6] 15.6
	50	3,250	18.8	--------	--------	[6] 17.8
	70	8,150	29.5	--------	--------	--------
60	30	850	10.4	1,000	9.6	19.2
	40	3,200	18.6	2,650	15.5	26.9
	50	6,300	32.9	5,600	21.3	31.4
	70	12,800	38.7	--------	--------	--------
70	30	1,750	14.9	2,650	15.1	33.1
	40	5,500	24.6	6,780	23.2	46.3
	50	9,750	33.3	11,400	31.3	54.0
	70	17,700	47.4	--------	--------	--------
80	30	3,350	19.9	5,500	20.8	56.7
	40	8,600	30.7	11,230	31.2	76.9
	50	18,600	40.6	17,620	41.3	92.9
	70	23,100	56.1	--------	--------	--------
90	30	--------	--------	8,710	26.6	--------
	40	--------	--------	16,300	39.0	--------
	50	--------	--------	24,400	51.9	--------
	70	--------	--------	--------	--------	--------
100	30	--------	--------	17,150	32.4	--------
	40	--------	--------	21,790	47.3	--------
	50	--------	--------	32,150	61.7	--------
	70	--------	--------	--------	--------	--------

[1] According to International rule, ⅛ inch, for stems to a top diameter of 5 inches inside bark.
[2] Unpeeled volume in standard cords of merchantable stems to top diameter of 4 inches outside bark.
[3] According to International rule, ⅛ inch, for stems to a top diameter of 6 inches inside bark.
[4] Peeled volume in standard cords of all trees 5 inches or more in diameter breast high and to a top diameter of 6 inches inside bark.
[5] Unpeeled volume in standard cords of all stems 4 inches or more in diameter breast high and to a top diameter of 4 inches outside bark. Computed from cubic-foot values for 100 percent density stands using a converting factor of 85 cubic feet per standard cord.
[6] Extrapolated from values for site indexes 55 through 80.

The soils of the area have been evaluated according to a nationwide system put into effect by woodland conservationists and soil scientists of the Soil Conservation Service. In this system, mapping units are placed in woodland suitability *classes* according to their potential productivity for a tree species or group of tree species. They are put into *subclasses* according to selected soil properties or characteristics that can restrict woodland management operations.

The woodland suitability classes defining a range of site index indicate potential soil productivity. Within the Northeast Region, which includes the State of West Virginia, six woodland suitability classes are established.

Woodland suitability classes are designated by Arabic numerals 1 through 6. Class 1 is potentially the highest in productivity, followed consecutively by classes 2, 3, 4, and so on, to include the entire site-index range of each species or forest type. Only classes 1 through 5 occur in the survey area.

The site index for those classes is as follows:

Class 1, 85+ for upland oaks; 95+ for yellow-poplar.
Class 2, 75 to 85 for upland oaks; 85 to 95 for yellow-poplar.
Class 3, 65 to 75 for upland oaks; 75 to 85 for yellow-poplar.
Class 4, 55 to 65 for upland oaks; 55 to 65 for Virginia pine.
Class 5, 45 to 55+ for upland oaks.

The subclasses are designated by adding a small letter *x*, *w*, *t*, *d*, *c*, *s*, *f*, *r*, or *o*, to the class numeral, for example, 3x. The letter *x* indicates that the soils have restrictions or limitations because of stoniness or rockiness; *w* indicates excessive wetness; *t* indicates toxic substances; *d* indicates restricted rooting depth; *c* indicates restrictions or limitations because of clay in the upper part of the soil profile; *s* indicates dry, sandy soils; *f* indicates limitations that result from large amounts of coarse fragments in the soil profile; *r* indicates limitations of steepness of slope only; and *o* indicates soils that have no significant restrictions or limitations for woodland use and management. Some kinds of soils may have more than one subclass characteristic. Priority in placing each kind of soil into a subclass is in the order that the subclass characteristics are listed in the first sentence of this paragraph. None of the soils in the area have been assigned to subclasses *d*, *c*, *s*, or *t*.

Following are explanations of the terms used in the headings in table 3.

Erosion hazard refers to the soil erosion that may occur following cutting operations and where the soil is exposed along roads, skid trails, fire lanes, and log decking areas. Slope and texture of the soil are the main features considered for this rating. The hazard of erosion is *slight* if potential erosion is unimportant. It is *moderate* if some attention, such as diversion of water, is needed to prevent accelerated erosion. It is *severe* if intensive treatment is needed to control soil losses. Intensive treatment is the special care that must be taken in locating and building roads and skid trails, in diverting water during and after logging, and, in some places, in seeding grasses.

Equipment restrictions refers to trafficability of the soil. The ratings given indicate the degree to which the soil and its topographic features restrict the use of equipment commonly used in tree harvesting or cultural work. Soil wetness, size and amount of stones, clayey subsoil, and slope are the main causes of equipment restrictions. The restriction is *slight* if there is little or no limitation on the kind of equipment or the time of year equipment is used and if slopes are generally less than 20 percent. The restriction is *moderate* if the use of equipment is limited for less than 3 months a year by soil wetness and if slopes generally range from 20 to 40 percent. It is *severe* if the use of equipment is limited for more than 3 months a year by soil wetness, if there are large and numerous stones, or if slopes exceed 40 percent.

Seedling mortality refers to the expected degree of

failure for natural seedlings or planting stock as influenced by kind of soil, degree of erosion, or other site factors, but not by plant competition. Excessive wetness or droughtiness are the main factors considered in this rating. A rating of *slight* means that expected mortality is less than 25 percent; *moderate* means that expected mortality is between 25 and 50 percent; and *severe* means that expected mortality is more than 50 percent.

Plant competition is the invasion or growth of undesirable plants when openings are made in the canopy. In Raleigh and Fayette Counties, plant competition is generally more severe for pines than for hardwoods. A rating of *slight* means that competition does not prevent adequate natural regeneration of desirable species; *moderate* means that competition delays but does not prevent natural or artificial regeneration; and *severe* means that competition prevents such regeneration unless intensive site preparation and maintenance, such as weeding, is employed. Plant competition normally increases with increasing productivity and wetness of soils.

Windthrow hazard is evaluated by considering soil characteristics that control development of tree roots and therefore affect how firmly trees stand against wind. Depth to bedrock or other root-restricting layers are considered for this hazard. A rating of *slight* means that there are no special problems. A rating of *moderate* means that root development is adequate for stability, except during periods of excessive soil wetness or periods of strong wind velocity; and *severe* means that the depth to which tree roots extend does not give adequate stability and that individual trees are easily blown over during periods of higher than average wind velocity.

Species suitability refers to commercially important species (1) to favor in existing stands; (2) to favor in planting; and (3) suitable for Christmas trees. The species are not listed in order of priority.

Use of the Soils for Wildlife [3]

Fayette and Raleigh Counties have a good number of native wildlife species because the counties have a favorable range of climate and soils. Because more than four-fifths of the survey area is wooded, woodland types of wildlife are most common. These species include ruffed grouse, squirrel, white-tailed deer, raccoon, and gray fox. Rabbit, squirrel, woodchuck, red fox, a few quail, and a few mourning dove inhabit the limited farming areas. Ducks and other wetland wildlife are not numerous, but woodcock frequent the larger areas of wet soils. Because the area of open land is small and the quantity of wildlife fairly high, the demand for areas developed primarily for wildlife habitat is increasing.

This section contains information on how various characteristics of the soils of Fayette and Raleigh Counties relate to a number of elements of habitat for native wildlife. The method of rating soils and the uses of the resulting information are discussed. The soil and wildlife habitat relationships are shown in table 5, together with tabulation of broad relationships with open-land, woodland, and wetland wildlife types.

[3] WILLIAM J. MELVIN, field biologist, Soil Conservation Service, assisted in preparing this subsection.

The kinds and abundance of most wildlife species in an area depend largely on the presence and adequate distribution of food, shelter, and water. Various kinds of habitat elements are required to serve these needs throughout the year. The absence, inadequacy, or inaccessibility of any one of these important elements may result in scarcity or absence of a particular kind of wildlife.

Many of the habitat needs of wildlife are provided by various kinds of vegetation and by suitable watering places. Soil characteristics influence the adaptability, growth, and productivity of plants. They also have an effect on the distribution of water and the kinds of watering places serving wildlife. Knowledge of such relationships aids in managing both vegetation and water. Plant management for wildlife is achieved by planting, inducing natural establishment. manipulating existing vegetation, or by combination of such measures. Water management involves creating or improving water areas and water supplies.

Not rated in table 5 are such other important wildlife habitat elements as ponds of the impoundment type. For information about uses and limitations of the soils for these and for access roads, buildings, and other structures needed in developing areas for wildlife habitat, refer to the section "Engineering Uses of the Soils" and the section "Use of the Soils for Town and Country Planning."

Knowledge about individual wildlife species and their habitat requirements is needed for effective use of soil wildlife interpretations. The techniques for determining existing kinds, amounts, distribution, and quality of wildlife habitats can be found in wildlife journals, textbooks, and other publications.

Information in this section can be used to aid in—

1. Broad-scale wildlife land-use planning, such as for parks, wildlife refuges, nature study areas, and recreational developments.
2. Selecting better suited soils for creating, improving, or maintaining the various kinds of wildlife habitat elements.
3. Determining the relative degree of management intensity required to attain satisfactory results.
4. Eliminating sites on which it is difficult or not feasible to attempt habitat management.
5. Determining areas desirable for habitat preservation and those suitable for acquisition as wildlife habitat.

The soil-wildlife interpretations are only guides, for detailed planning and application must be supplemented by onsite investigation. No attempt is made to relate individual kinds of wildlife to the soils. Not considered are present land use, size of areas, economic values, existing vegetation, the relationships of one soil to another, and the mobile nature of wildlife.

In table 5 the soils of Fayette and Raleigh Counties are rated on their relative suitability for the creation, improvement, or maintenance of seven elements and three kinds of wildlife habitat (*1*). These ratings are based on limitations imposed by the characteristics or behavior of the soils. Four levels of suitability are recognized—well suited, suited, poorly suited, and unsuited. Particular soil properties commonly impose different degrees of limitation on different habitat elements. For example, the

TABLE 5.—*Suitability of the soils for elements*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Alluvial land: Ad. Too variable to be rated.				
Ashton: As	Well suited	Well suited	Well suited	Well suited
Atkins: At	Poorly suited	Suited	Suited	Well suited
Brinkerton: Br	Poorly suited	Poorly suited	Suited	Suited
Calvin-Gilpin:				
CaC	Suited	Suited	Suited	Suited
CaD	Poorly suited	Suited	Suited	Suited
CaD3, CaE, CgC, CgE	Unsuited	Poorly suited	Suited	Suited
CaE3, CaF, CaF3, CgF	Unsuited	Unsuited	Suited	Suited
Chavies: Ch	Well suited	Well suited	Well suited	Well suited
Clymer: ClB, ClC	Suited	Well suited	Well suited	Well suited
Cookport: CpB	Suited	Well suited	Well suited	Well suited
Dekalb:				
DbB, DbC	Suited	Suited	Suited	Suited
DcD	Poorly suited	Suited	Suited	Suited
DcE	Unsuited	Poorly suited	Suited	Suited
Dekalb and Gilpin:				
DsC, DsE	Unsuited	Poorly suited	Suited	Suited
DsF	Unsuited	Unsuited	Suited	Suited
Ernest: ErB, ErC	Suited	Well suited	Well suited	Well suited
Ernest and Shelocta: EsC, EsE	Unsuited	Poorly suited	Well suited	Well suited
Gilpin:				
GlB, GlC	Suited	Well suited	Well suited	Suited
GlC3, GlD	Poorly suited	Suited	Well suited	Suited
GlD3, GlE	Unsuited	Poorly suited	Well suited	Suited
GlE3, GlF, GlF3	Unsuited	Unsuited	Well suited	Suited
Gravelly alluvial land: Gr. Too variable to be rated.				
Landes: La	Suited	Well suited	Well suited	Well suited
Lickdale: Lc	Unsuited	Poorly suited	Poorly suited	Well suited
Made land: Ma. Too variable to be rated.				
Meckesville:				
McB, McC	Suited	Well suited	Well suited	Well suited
MdC, MdE	Unsuited	Poorly suited	Well suited	Well suited
Mine dump: Me. Too variable to be rated.				
Monongahela:				
MgA	Suited	Well suited	Well suited	Well suited
MgB	Suited	Well suited	Well suited	Well suited
Muskingum:				
MkC	Suited	Suited	Well suited	Suited
MkC3, MkD	Poorly suited	Suited	Well suited	Suited
MkD3, MkE, MnE	Unsuited	Poorly suited	Well suited	Suited
MkE3, MkF, MnF	Unsuited	Unsuited	Well suited	Suited

of wildlife habitat and kinds of wildlife

Elements of wildlife habitat—Continued			Kinds of wildlife		
Coniferous woody plants	Wetland food and cover plants	Shallow-water developments	Open-land wildlife	Woodland wildlife	Wetland wildlife
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Suited	Suited	Suited	Suited	Well suited	Suited.
Suited	Poorly suited	Unsuited	Poorly suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Well suited	Well suited	Well suited	Poorly suited	Well suited	Well suited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Poorly suited	Poorly suited	Unsuited.

TABLE 5.—*Suitability of the soils for elements*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants
Philo: Ph	Suited	Well suited	Well suited	Well suited
Pope: Po	Suited	Well suited	Well suited	Well suited
Rayne: RaB, RaC	Suited	Well suited	Well suited	Well suited
Shelocta:				
ShC	Suited	Well suited	Well suited	Well suited
ShD	Poorly suited	Suited	Well suited	Well suited
ShE	Unsuited	Suited	Well suited	Well suited
Steep rock land: Sr. Too variable to be rated.				
Strip mine spoil: St. Too variable to be rated.				
Summers: SuB	Suited	Suited	Suited	Suited
Wharton:				
WhB, WhC	Suited	Well suited	Well suited	Well suited
WhC3	Poorly suited	Suited	Well suited	Well suited

of wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued			Kinds of wildlife		
Coniferous woody plants	Wetland food and cover plants	Shallow-water developments	Open-land wildlife	Woodland wildlife	Wetland wildlife
Poorly suited	Poorly suited	Poorly suited	Well suited	Well suited	Poorly suited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Suited	Unsuited	Unsuited	Suited	Suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Well suited	Well suited	Unsuited.
Poorly suited	Unsuited	Unsuited	Suited	Suited	Unsuited.

habitat element wild herbaceous upland plants is moderately limited by the slopes of Dekalb channery loam, 20 to 30 percent slopes. Therefore the soil is rated "suited." But for the habitat element grain and seed crops the same percent of slope can impose a higher limitation, and the soil is rated "poorly suited." The ratings are defined in the following paragraphs.

Well suited means that soil limitations are negligible in the management of the designated habitat element. Generally, the intensity of management required for the creation, improvement, or maintenance of the desired habitat element is low, and satisfactory results are well assured.

Suited means that soil limitations moderately affect the management of the designated habitat element. Fairly frequent attention and moderate effort are required for satisfactory results.

Poorly suited means that soil limitations are severe. The creation, improvement, or maintenance of the designated habitat element is difficult, may be expensive, and requires intensive effort for satisfactory results. For short-term usage, however, poorly suited soils can provide habitat that is easy to establish but has temporary value.

Unsuited means that the soil limitation is so extreme that it is highly impractical, if not impossible, to manage the designated habitat element.

The following paragraphs define the seven wildlife habitat elements rated in table 5.

Grain and seed crops are seed-producing annuals planted to produce food for wildlife. Examples are corn, sorghum, wheat, oats, millet, buckwheat, and soybeans.

Grasses and legumes are perennial grasses and herbaceous legumes that are established by planting and that furnish wildlife food and cover. Examples are fescue, bluegrass, timothy, orchardgrass, reed canarygrass, clover, and sericea lespedeza.

Wild herbaceous upland plants are native or introduced perennial grasses and forbs (weeds) that provide food and cover principally to upland forms of wildlife, and that are established mainly through natural processes. Examples are indiangrass, wildrye, oatgrass, pokeweed, blackberries, bush lespedeza, beggarweed, ragweed, goldenrod, and dandelion.

Hardwood woody plants are nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs (browse), or foliage used extensively as food by wildlife, and which commonly are established through natural processes but also can be planted. Examples are oak, beech, hickory, walnut, cherry, dogwood, poplar, grape, and honeysuckle.

Coniferous woody plants are cone-bearing trees and shrubs, mostly evergreen. They are important shelter plants but also provide browse and seeds. Locally adapted species include white pine, Virginia pine, and redcedar. These plants can be naturally established on bare soil or where plant cover is sparse. Such soil characteristics as shallowness, dryness, and other qualities that cause plants to grow slowly and delay closure of the canopy provide the better conditions for this habitat element.

Wetland food and cover plants are annual and perennial, wild herbaceous plants on moist to wet sites, exclusive of submerged or floating aquatics, that produce food or cover that is extensively and dominantly used by wetland forms of wildlife. Examples are smartweed, wild millet, rushes, sedges, reeds, wildrice, switchgrass, and cattails.

Shallow-water developments are impoundments or excavations for control of water, generally not exceeding 6 feet in depth. Examples are low dikes and levees, shallow dugouts, level ditches, and devices to control the water level in marshy drainageways or channels.

Table 5 also rates the soils according to their suitability for the three kinds of wildlife—openland, woodland, and wetland—in the two counties. The suitability ratings of the soils for kinds of wildlife were made on the basis of weighted values assigned to a selection of habitat elements appropriate to the kind of wildlife. For example, grain and seed crops, grasses and legumes, wild herbaceous upland plants, and hardwood woody plants were used for openland wildlife. For woodland wildlife the elements grasses and legumes, wild herbaceous upland plants, hardwood woody plants, and coniferous woody plants were used. Wetland wildlife habitat elements include wetland food and cover plants and shallow-water developments.

Open-land wildlife consists of birds and mammals that commonly frequent cropped fields, meadows, pastures, and areas overgrown with grasses, weeds, and shrubs. Examples are bobwhite quail, mourning dove, woodcock, cottontail rabbit, meadowlark, killdeer, and field sparrow.

Woodland wildlife consists of birds and mammals that commonly frequent wooded areas. Examples are ruffed grouse, deer, squirrel, raccoon, wood thrush, ovenbird, and vireo.

Wetland wildlife consists of birds and mammals that commonly frequent wet areas, such as ponds, marshes, and swamps. Examples are duck, geese, heron, snipe, rail, coot, muskrat, mink, and beaver.

Engineering Uses of the Soils [4]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.

[4] DAVID C. RALSTON, State conservation engineer, Soil Conservation Service, helped prepare this section.

2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 6, 7, and 8, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 6 and 7, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths of more than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists that is not known to all engineers. The Glossary defines many of these terms commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*16*) used by the Soil Conservation Service engineers, the Department of Defense, and other agencies, and the AASHO system (*2*) adopted by the American Association of State Highway Officials. Both of these systems are briefly defined in the "PCA Soil Primer" (*10*).

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and content of organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML–CL.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 8; the estimated classification, without group index numbers, is given in table 6 for all soils mapped in the survey area.

Soil properties significant to engineering

Table 6 shows the estimated physical properties most likely to affect engineering practices. Properties were estimated on the basis of (1) test data in table 8, (2) test data for similar soils in Monroe County, and (3) coordinated data from northeastern states for which data from all known sources were considered.

Depth to seasonal high water table and to bedrock are given in table 6. Soils that have a high water table are limited in their use for construction. Depth to bedrock greatly affects the design, construction, and maintenance of structures.

The column "Depth from the surface" indicates the depth and thickness of the layers for which estimates were made.

Information in the remaining columns is given by soil layers. Textures shown for the various layers under the USDA textural classification are those indicated in the detailed profile.

The two engineering classifications, Unified and AASHO, have been described.

The percentage passing sieve is the normal range of soil particles passing the respective screen sizes. In table 8, the percentage passing sieves for the Dekalb series is higher than normal for the series because the test method used for these engineering tests broke down many weakly cemented coarse aggregates.

Permeability refers to the rate of movement of water downward through the undisturbed soil. It depends largely on the soil texture and structure. In table 6 water permeability is estimated in inches per hour. It is defined in more detail in the Glossary.

Reaction is the degree of acidity or alkalinity of the soil material expressed in pH value. The values are based on several field checks. In this system of notation, pH 7 is neutral; higher values indicate alkaline material and lower values indicate acid material, as explained in the Glossary. The pH values given in table 6 are for unlimed soils.

Available water capacity is the amount of water in a soil, at field capacity, that can be removed by plants. The rating, expressed in inches of water per inch of soil depth, is of particular value in irrigation.

TABLE 6.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in referring to other series that appear in the first column of this table.

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Depth from surface (representative profile)	Classification: USDA texture	Classification: Unified	Classification: AASHO
Alluvial land: Ad. Too variable to be rated.						
	Ft.	*Ft.*	*In.*			
Ashton: As	>6	>5	0–10	Fine sandy loam	ML, SM	A–4
			10–48	Silt loam	CL, ML	A–4, A–6
			48–60	Silt loam to fine sandy loam.	SM, ML	A–4, A–6
Atkins: At	[1] 0	>4	0–10	Silt loam	ML, CL	A–4, A–6
			10–34	Silty clay loam, silt loam.	ML, CL	A–4, A–6
			34–55	Silt loam	ML, CL, SM	A–4, A–6
Brinkerton: Br	½–1	>4	0–8	Silt loam	ML, CL	A–4, A–6
			8–25	Silty clay loam	ML, CL, MH	A–6, A–7
			25–54	Silty clay loam (fragipan).	ML, MH, CL	A–6, A–7, A–4
*Calvin: CaC, CaD, CaD3, CaE, CaE3, CaF, CaF3, CgC, CgE, CgF. For properties of Gilpin soils in these mapping units, see Gilpin series.	>4	1½–2½	0–6	Silt loam	ML, CL	A–4, A–6
			6–15	Silt loam	ML, CL, SM	A–4, A–6
			15–24	Very channery silt loam.	GM, GC	A–2, A–4
			24	Siltstone bedrock.		
Chavies: Ch	>4	>4	0–34	Fine sandy loam	SM, ML	A–4
			34–50	Sandy loam, loamy sand.	SM, ML	A–2, A–4
Clymer: ClB, ClC	>4	3½–>5	0–12	Loam, fine sandy loam.	SM, ML	A–4
			12–32	Clay loam, fine sandy loam.	SM, ML	A–4, A–6
			32–44	Sandy loam, loam	SM, SC	A–2, A–4
			44	Sandstone bedrock.		
Cookport: CpB	1½–2	3½–>4	0–12	Loam	SM, ML	A–4
			12–20	Clay loam	ML, CL, SM	A–4, A–6
			20–12	Clay loam (fragipan)	ML, CL, SM	A–4, A–6, A–2
			42	Sandstone bedrock.		
*Dekalb: DbB, DbC, DcD, DcE, DsC, DsE, DsF. For properties of Gilpin soils in DsC, DsE, and DsF, see Gilpin series.	>4	1½–3½	0–8	Loam	SM, ML, SM–SC	A–4, A–2
			8–21	Channery fine sandy loam.	ML, SM, GM, SM–SC	A–2, A–4
			21–39	Very channery sandy loam.	SM, GM, SM–SC	A–2, A–4
			39	Sandstone bedrock.		
*Ernest: ErB, ErC, EsC, EsE. For properties of Shelocta soils in EsC and EsE, see Shelocta series.	1½–2	>4	0–10	Silt loam	ML, CL	A–4, A–6
			10–27	Silty clay loam	ML, CL, MH or CH	A–6, A–7
			27–55	Channery silty clay loam (fragipan).	ML, CL, MH	A–4, A–6, A–7
Gilpin: GlB, GlC, GlC3, GlD, GlD3, GlE, GlE3, GlF, GlF3.	>3	2–3	0–11	Silt loam	ML, CL, ML–CL	A–4
			11–22	Channery silty clay loam.	ML, CL, ML–CL	A–4, A–6, A–7
			22–31	Very channery heavy silt loam.	ML, CL, ML–CL, MH, GC, GM	A–2, A–4, A–6, A–7
			31	Shale bedrock.		
Gravelly alluvial land: Gr. Too variable to be rated.						

See footnotes at end of table.

significant to engineering

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for
The symbol < means less than; the symbol > means more than]

Percentage passing sieve—			Permeability	Reaction	Available moisture capacity	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
			In./hr.	*pH*	*In./in. of soil*	
95–100	80–95	40–70	2.00–6.30	6.1–7.3	0.18–0.24	Low.
85–95	80–95	60–80	0.63–2.00	6.1–7.3	0.15–0.21	Low.
85–95	80–90	40–80	0.63–6.30	6.1–7.3	0.12–0.18	Low.
90–100	90–100	70–95	0.63–2.00	4.5–5.5	0.18–0.24	Low.
90–100	90–100	65–85	0.20–0.63	4.5–5.5	0.15–0.18	Moderate.
90–100	90–100	45–85	0.20–0.63	4.5–5.5	0.12–0.18	Moderate.
90–100	90–100	75–95	0.63–2.00	4.5–5.5	0.18–0.24	Low.
90–100	90–100	80–95	0.20–0.63	4.5–5.5	0.15–0.18	Moderate.
85–100	80–100	70–85	<0.20	4.5–5.5	0.08–0.12	Moderate.
70–90	70–90	50–80	2.00–6.30	4.5–5.5	0.12–0.18	Low.
60–85	60–85	45–80	2.00–6.30	4.5–5.5	0.12–0.15	Low to moderate.
40–75	35–60	15–45	2.00–6.30	4.5–5.5	0.08–0.12	Low.
95–100	80–95	40–70	2.00–6.30	5.1–6.0	0.12–0.18	Low.
95–100	80–95	30–55	2.00–6.30	5.1–6.0	0.08–0.15	Low.
80–100	75–95	40–60	2.00–6.30	4.5–5.5	0.12–0.18	Low.
80–100	70–95	30–60	0.63–2.00	4.5–5.5	0.12–0.15	Low.
60–90	65–85	25–45	2.00–6.30	4.5–5.5	0.08–0.12	Low.
80–95	75–90	40–70	2.00–6.30	4.5–5.5	0.15–0.21	Low.
65–95	65–95	40–65	0.63–2.00	4.5–5.5	0.12–0.18	Low.
70–90	65–85	35–55	0.20–0.63	4.5–5.5	0.08–0.12	Low.
55–95	45–90	30–60	2.00–6.30	4.5–5.5	0.08–0.15	Low.
50–85	40–85	20–55	2.00–6.30	4.5–5.5	0.08–0.12	Low.
45–85	35–75	15–45	2.00–6.30	4.5–5.5	0.05–0.08	Low.
80–100	75–100	70–85	0.63–2.00	4.5–5.5	0.15–0.21	Low.
75–100	75–100	75–90	0.63–2.00	4.5–5.5	0.12–0.18	Moderate.
75–100	65–100	60–90	0.20–0.63	4.5–5.5	0.08–0.12	Moderate.
85–100	80–95	60–85	0.63–2.00	4.5–5.5	0.15–0.21	Low.
65–90	60–85	55–80	0.63–2.00	4.5–5.5	0.12–0.15	Moderate.
40–85	35–75	15–70	0.63–2.00	4.5–5.5	0.08–0.12	Moderate.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock	Depth from surface (representative profile)	Classification		
				USDA texture	Unified	AASHO
	Ft.	*Ft.*	*In.*			
Landes: La	[1] >4	>5	0–31	Fine sandy loam	SM, ML	A–4
			31–60	Stratified sandy loam and silt loam.[2]	(2)	(2)
Lickdale: Lc	0	>5	0–18	Silt loam	ML	A–4
			18–40	Silty clay loam to silt loam.	ML, CL, MH	A–6, A–7
			40–60	Silt loam	ML, CL	A–4, A–6
Made land: Ma. Too variable to be rated.						
Meckesville: McB, McC, MdC, MdE	>3	>5	0–23	Silt loam to silty clay loam.	ML, CL	A–4, A–6
			23–38	Channery silty clay loam.	ML, CL	A–4, A–6
			38–62	Channery silty clay loam.	ML, CL, SM, GM	A–4, A–6
Mine dump: Me. Too variable to be rated.						
Monongahela: MgA, MgB	1½–2	>5	0–13	Silt loam	ML, CL	A–4, A–6
			13–28	Heavy silt loam	ML, CL	A–6, A–7
			28–56	Silt loam and clay loam (fragipan).	ML, CL	A–4, A–6
Muskingum: MkC, MkC3, MkD, MkD3, MkE, MkE3, MkF, MnE, MnF.	>3	2–3	0–11	Silt loam	ML, CL	A–4, A–6
			11–35	Channery silt loam	ML, CL, ML–CL	A–4, A–6
			35	Siltstone bedrock.		
Philo: Ph	[1] 1–2	>4	0–15	Silt loam	ML	A–4
			15–28	Loam to silt loam	ML	A–4
			28–50	Loam to sandy loam.	ML, SM	A–4
Pope: Po	[1] >3	>4	0–32	Fine sandy loam	ML, SM	A–4
			32–50	Stratified sands, silts, and a few pebbles.	(2)	(2)
Rayne: RaB, RaC	>3	3½–4	0–10	Silt loam	ML, CL	A–4
			10–33	Silty clay loam, silt loam.	ML, CL	A–4, A–6
			33–45	Channery clay loam.	ML, CL, GM	A–4, A–6
			45	Sandstone bedrock.		
Shelocta: ShC, ShD, ShE	>3	>4	0–15	Silt loam	ML, CL	A–4, A–6
			15–37	Channery silty clay loam.	SM, ML, CL	A–4, A–6
			37–60	Channery silt loam to channery loam.	GM, ML, CL	A–4, A–6
Steep rock land: Sr. Too variable to be rated.						
Strip mine spoil: St. Too variable to be rated.						
Summers: SuB	4	1½–3	0–14	Loam	SM, ML	A–2, A–4
			14–22	Channery fine sandy loam.	ML, SM	A–2, A–4
			22–33	Very channery sandy loam.	SM, GM	A–2, A–4
			33	Sandstone bedrock.		
Wharton: WhB, WhC, WhC3	1½–2	>4	0–9	Silt loam	MH, ML, CL	A–4, A–6, A–7
			9–29	Silty clay loam to silty clay.	ML, CL, CH, or MH	A–6, A–7
			29–60	Clay	CH, MH, CH–MH, CL, CL–ML	A–6, A–7

[1] Subject to periodic flooding.

significant to engineering—Continued

Percentage passing sieve—			Permeability	Reaction	Available moisture capacity	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
			In./hr.	*pH*	*In./in. of soil*	
95–100	95–100	40–70	2.00–6.30	6.1–7.3	0.12–0.18	Low.
([2])	([2])	([2])	2.00–6.30	6.1–7.3	0.08–0.15	Low.
90–100	85–100	70–95	2.00–6.30	4.5–5.5	0.15–0.21	Low.
90–100	80–100	70–85	<0.20	4.5–5.5	0.12–0.18	Moderate.
85–100	70–95	60–80	0.20–0.63	4.5–5.5	0.08–0.15	Low to moderate.
80–100	70–95	55–70	0.63–2.00	4.5–5.5	0.15–0.18	Low.
70–95	70–90	55–70	0.63–2.00	4.5–5.5	0.12–0.18	Moderate.
75–90	65–90	40–65	0.20–0.63	4.5–5.5	0.08–0.12	Moderate.
90–100	85–100	70–95	0.63–2.00	4.5–5.5	0.15–0.18	Low.
90–100	85–100	70–100	0.63–2.00	4.5–5.5	0.12–0.18	Moderate.
75–100	70–100	60–95	0.20–0.63	4.5–5.5	0.08–0.15	Moderate.
85–95	75–90	50–85	2.00–6.30	4.5–5.5	0.15–0.21	Low.
70–85	65–85	50–65	0.63–2.00	4.5–5.5	0.12–0.15	Moderate.
95–100	85–100	65–90	0.63–6.30	4.5–5.5	0.18–0.21	Low.
85–100	80–100	55–90	0.20–2.00	4.5–5.5	0.15–0.18	Low.
70–90	70–90	45–80	0.63–6.30	4.5–5.5	0.08–0.15	Low.
90–100	85–100	40–70	2.00–6.30	4.5–5.5	0.12–0.18	Low.
([2])	([2])	([2])	([2])	4.5–5.5	([2])	Low.
85–100	85–90	60–85	0.63–2.00	4.5–5.5	0.15–0.21	Low.
80–95	75–90	60–85	0.63–2.00	4.5–5.5	0.12–0.18	Moderate.
60–85	55–85	45–70	0.63–2.00	4.5–5.5	0.08–0.12	Moderate.
80–95	80–95	60–80	0.63–2.00	4.5–5.5	0.12–0.18	Low.
70–85	65–85	45–70	0.63–2.00	4.5–5.5	0.12–0.15	Moderate.
55–75	45–75	36–60	0.63–2.00	4.5–5.5	0.08–0.12	Moderate.
55–85	45–75	30–60	2.00–6.30	4.5–5.5	0.08–0.15	Low.
50–85	40–75	20–55	2.00–6.30	4.5–5.5	0.08–0.12	Low.
45–85	35–75	15–45	2.00–6.30	4.5–5.5	0.05–0.08	Low.
95–100	90–100	70–90	0.63–2.00	<4.5–5.0	0.18–0.21	Low.
95–100	85–100	80–95	0.63–2.00	<4.5–5.0	0.12–0.18	Moderate.
85–100	85–100	65–100	<0.20	<4.5–5.0	0.08–0.12	Moderate.

[2] Variable.

TABLE 7.—*Interpretations of engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in for referring to other series that appear

Soil series and map symbols	Suitability as source of— Topsoil	Suitability as source of— Road fill	Soil features affecting engineering practices for— Highway location
Alluvial land: Ad	Fair to good	Fair to poor: seasonal water table at depth of 0 to 3 feet.	Seasonal water table at depth of 0 to 3 feet; flooding; moderate frost-heave potential.
Ashton: As	Good	Fair: fair stability	Infrequent flooding
Atkins: At	Fair: seasonal water table at surface.	Poor to fair: low shear strength; seasonal water table at surface; moderate shrink-swell potential.	Flooding; seasonal water table at surface; high frost-heave potential.
Brinkerton: Br	Poor: seasonal water table at depth of ½ to 1 foot.	Poor: seasonal water table at depth of ½ to 1 foot; low shear strength; moderate shrink-swell potential.	Seasonal water table at depth of ½ to 1 foot; seepage; high frost-heave potential; poor stability.
*Calvin: CaC, CaD, CaD3, CaE, CaE3, CaF, CaF3, CgC, CgE, CgF. For the Gilpin part of these units, see Gilpin series.	Fair to poor: coarse fragments; bedrock at depth of 2 to 2½ feet.	Fair to good: bedrock at depth of 2 to 2½ feet.	Bedrock at depth of 2 to 2½ feet.
Chavies: Ch	Good	Fair to good: fair stability	Infrequent flooding
Clymer: ClB, ClC	Fair: coarse fragments; bedrock at depth of 3½ to 5 feet.	Fair to good: bedrock at depth of 3½ to 5 feet.	Bedrock at depth of 3½ to 5 feet
Cookport: CpB	Fair: bedrock at depth of 3½ to 4 feet; seasonal water table at depth of 1½ to 2 feet.	Fair: bedrock at depth of 3½ to 4 feet; seasonal water table at depth of 1½ to 2 feet.	Seasonal water table at depth of 1½ to 2 feet; seepage above fragipan; bedrock at depth of 3½ to 4 feet.
*Dekalb: DbB, DbC, DcD, DcE, DsC, DsE, DsF. For Gilpin part of DsC, DsE, and DsF, see Gilpin series.	Poor: coarse fragments; bedrock at depth of 2 to 3 feet.	Fair to good: bedrock at depth of 2 to 3 feet.	Bedrock at depth of 2 to 3 feet
*Ernest: ErB, ErC, EsC, EsE. For Shelocta part of EsC and EsE, see Shelocta series.	Fair: seasonal water table at depth of 1½ to 2 feet; coarse fragments.	Fair: moderate shrink-swell potential; low shear strength; seasonal water table at depth of 1½ to 2 feet.	Seasonal water table at depth of 1½ to 2 feet; seepage above fragipan; poor stability.
Gilpin: GlB, GlC, GlC3, GlD, GlD3, GlE, GlE3, GlF, GlF3.	Fair: coarse fragments; bedrock at depth of 2 to 3 feet.	Fair to poor: bedrock at depth of 2 to 3 feet; moderate shrink-swell potential.	Bedrock at depth of 2 to 3 feet.
Gravelly alluvial land: Gr	Poor: coarse fragments; seasonal water table below depth of 3 feet.	Good to fair: seasonal water table below depth of 3 feet.	Flooding; seasonal water table below depth of 3 feet.
Landes: La	Good	Fair: low shear strength	Flooding

properties of the soils

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions in the first column of this table]

Soil features affecting engineering practices for—Continued				
Farm ponds		Drainage for crops and pasture	Terraces and diversions	Pipeline construction and maintenance
Reservoir area	Embankment			
Flooding; pervious substratum.	Flooding; poor stability	Variable; well drained to poorly drained; flooding; seasonal water table at depth of 0 to 3 feet.	Flooding; seasonal water table at depth of 0 to 3 feet.	Flooding; seasonal water table at depth of 0 to 3 feet.
Infrequent flooding; sandy layers in substratum.	Infrequent flooding; fair stability; subject to piping.	Well drained	Features generally favorable.	Infrequent flooding.
Flooding; sandy layers in substratum.	Flooding; poor stability	Flooding; moderately slow permeability.	Flooding; seasonal water table at surface.	Flooding; seasonal water table at surface.
Few stones	Poor stability	Slow permeability	Seasonal water table at depth of ½ to 1 foot.	Seasonal water table at depth of ½ to 1 foot.
Bedrock at depth of 2 to 2½ feet; pervious substratum.	Bedrock at depth of 2 to 2½ feet; pervious material.	Well drained	Bedrock at depth of 2 to 2½ feet.	Bedrock at depth of 2 to 2½ feet.
Infrequent flooding; sandy layers in substratum.	Infrequent flooding; fair stability; subject to piping.	Well drained	Features generally favorable.	Infrequent flooding.
Bedrock at depth of 3½ to 5 feet; pervious substratum.	Pervious material.	Well drained	Bedrock at depth of 3½ to 5 feet.	Bedrock at depth of 3½ to 5 feet.
Bedrock at depth of 3½ to 4 feet.	Fair stability	Moderately slow permeability; seasonal water table at depth of 1½ to 2 feet.	Seepage above fragipan; bedrock at depth of 3½ to 4 feet	Seasonal water table at depth of 1½ to 2 feet; bedrock at depth of 3½ to 4 feet.
Bedrock at depth of 2 to 3 feet.	Pervious material	Well drained	Bedrock at depth of 2 to 3 feet.	Bedrock at depth of 2 to 3 feet.
Small seepage loss; stones in places.	Poor stability	Seasonal water table at depth of 1½ to 2 feet; moderately slow permeability.	Erodible; seepage above fragipan.	Seasonal water table at depth of 1½ to 2 feet; slips.
Bedrock at depth of 2 to 3 feet.	Fair stability; subject to piping.	Well drained	Bedrock at depth of 2 to 3 feet.	Bedrock at depth of 2 to 3 feet.
Flooding; pervious substratum.	Pervious material	Well drained	Flooding; seasonal water table below depth of 3 feet.	Flooding; seasonal water table below depth of 3 feet.
Flooding; sandy layers in substratum.	Flooding; fair stability	Well drained	Flooding	Flooding.

TABLE 7.—*Interpretations of engineering*

Soil series and map symbols	Suitability as source of—		Soil features affecting engineering practices for—
	Topsoil	Road fill	Highway location
Lickdale: Lc	Poor: seasonal water table at surface.	Poor: seasonal water table at surface; moderate shrink-swell potential.	Seasonal water table at surface
Made land: Ma. Too variable to be rated.			
Meckesville: McB, McC, MdC, MdE.	Fair: coarse fragments; seasonal water table below depth of 3 feet.	Moderate: moderate shrink-swell potential; low shear strength; seasonal water table below depth of 3 feet.	Seep spots; seepage above fragipan; seasonal water table below depth of 3 feet.
Mine dump: Me. Too variable to be rated.			
Monongahela: MgA, MgB	Fair: seasonal water table at depth of 1½ to 2 feet.	Fair: moderate shrink-swell potential; low shear strength; seasonal water table at depth of 1½ to 2 feet.	Seasonal water table at depth of 1½ to 2 feet; seepage above fragipan.
Muskingum: MkC, MkC3, MkD, MkD3, MkE, MkE3, MkF, MnE, MnF.	Fair: coarse fragments; bedrock at depth of 2 to 3 feet.	Fair: bedrock at depth of 2 to 3 feet; moderate shrink-swell potential.	Bedrock at depth of 2 to 3 feet
Philo: Ph	Good to fair: seasonal water table at depth of 1½ to 2 feet.	Fair: seasonal water table at depth of 1½ to 2 feet.	Flooding; seasonal water table at depth of 1½ to 2 feet; high frost-heave potential.
Pope: Po	Good	Good	Flooding; moderate frost-heave potential.
Rayne: RaB, RaC	Fair: coarse fragments; bedrock below depth of 3½ feet.	Fair: moderate shrink-swell potential; low shear strength; bedrock below depth of 3½ feet.	Bedrock below depth of 3½ feet.
Shelocta: ShC, ShD, ShE	Fair: coarse fragments	Fair: moderate shrink-swell potential; low shear strength.	Seep spots
Steep rock land: Sr. Too variable to be rated.			
Strip mine spoil: St. Too variable to be rated.			
Summers: SuB	Fair: coarse fragments; bedrock at depth of 2 to 3 feet.	Fair: bedrock at depth of 2 to 3 feet.	Bedrock at depth of 2 to 3 feet
Wharton: WhB, WhC, WhC3	Fair: seasonal water table at depth of 1½ to 2 feet; bedrock below depth of 4 feet.	Poor: low shear strength; moderate shrink-swell potential; seasonal water table at depth of 1½ to 2 feet; bedrock below depth of 4 feet.	Seasonal water table at depth of 1½ to 2 feet; slips; poor stability; bedrock below depth of 4 feet; moderate frost-heave potential.

properties of the soils—Continued

Soil features affecting engineering practices for—Continued					
Farm ponds		Drainage for crops and pasture	Terraces and diversions	Pipeline construction and maintenance
Reservoir area	Embankment			
Pervious layers in substratum in places.	Poor stability	Seasonal water table at surface; slow permeability.	Seasonal water table at surface.	Seasonal water table at surface.
Seepage	Fair stability; subject to piping.	Well drained	Features generally favorable.	Slips.
Sandy layers in substratum in places.	Fair stability	Seasonal water table at depth of 1½ to 2 feet; moderately slow permeability.	Seepage above fragipan	Seasonal water table at depth of 1½ to 2 feet.
Bedrock at depth of 2 to 3 feet; pervious substratum.	Fair stability	Well drained	Bedrock at depth of 2 to 3 feet.	Bedrock at depth of 2 to 3 feet.
Flooding; sandy layers in substratum.	Flooding; pervious material; fair stability; subject to piping.	Seasonal water table at depth of 1½ to 2 feet; moderately slow permeability.	Flooding; seasonal water table at depth of 1½ to 2 feet.	Flooding; seasonal water table at depth of 1½ to 2 feet.
Flooding; sandy layers in substratum.	Flooding; pervious material; subject to piping.	Well drained	Flooding	Flooding.
Pervious substratum	Fair stability; subject to piping.	Well drained	Bedrock below depth of 3½ feet.	Bedrock below depth of 3½ feet.
Low seepage loss	Fair stability	Well drained	Features generally favorable.	Slips.
Bedrock at depth of 2 to 3 feet; pervious substratum.	Pervious material	Well drained	Bedrock at depth of 2 to 3 feet.	Bedrock at depth of 2 to 3 feet.
Low seepage loss	Poor stability; erodible	Seasonal water table at depth of 1½ to 2 feet; slow permeability.	Erodible; slips where saturated.	Seasonal water table at depth of 1½ to 2 feet; bedrock below depth of 4 feet; slips.

TABLE 8.—*Engineering*

[Tests were performed by Soil Mechanics Laboratory,

Soil name and location	Parent material	Report No.	Depth	Moisture density data [1]	
				Maximum dry density	Optimum moisture
			In.	*Lb./cu. ft.*	*Pct.*
Dekalb very stony loam: [S65WVA 41-6(1-2)] 1.8 miles NE. of White Oak on State Route 27, Raleigh County. (Modal.)	Sandstone	66-0-99 66-0-107	8-21 21-33	114 118	12 12
Dekalb channery loam: [S65WVA 10-4(1-3)] 0.4 mile NW. of Oak Hill on State Route 18/1, Fayette County. (Low coarse fragments).	Sandstone	66-0-80 66-0-87 66-0-91	0-6 12-30 30-38	105 118 116	17 12 12
Ernest silt loam: [S65WVA 10-5(1-3)] 1 mile E. of Layland on State Route 41/13, Fayette County. (Modal.)	Colluvium	66-0-81 66-0-88 66-0-92	0-7 10-18 27-47	93 99 102	25 23 21
[S65WVA 41-7(1-3)] At Bradley along U.S. Route 21 opposite roadside park, Raleigh County. (Coarse subsoil range.)	Colluvium	66-0-100 66-0-108 66-0-112	15-25 31-48 48-60	98 100 104	23 21 19
[S65WVA 41-8(1-2)] At Fairdale ½ mile N. of State Route 15, Raleigh County. (Fine texture range.)	Colluvium	66-0-101 66-0-109	14-26 30-44	93 96	26 24
Gilpin silt loam: [S65WVA 10-6(1-3)] ½ mile N. of Glen Jean on U.S. Route 21, Fayette County. (Modal.)	Shale and siltstone	66-0-82 66-0-89 66-0-93	0-8 11-22 22-31	100 103 100	17 20 22
[S65WVA 41-4(1-2)] 2 miles S. of Daniels on State Route 19/13, Raleigh County. (Clay shale substrata.)	Shale and siltstone	66-0-97 66-0-105	11-22 22-33	105 103	18 20
[S65WVA 10-1(1-2)] East of Glen Jean, 1 mile on unimproved road through strip mines, Fayette County. (High shale subsoil.)	Shale	66-0-77 66-0-84	11-19 23-32	101 104	21 21
Wharton silt loam: [S65WVA 41-5(1-3)] 1 mile NE. of White Oak on State Route 27, Raleigh County. (Modal.)	Shale	66-0-98 66-0-106 66-0-111	0-9 15-24 42-59	89 93 95	26 26 23
[S65WVA 41-1(1-2)] 2 miles SW. of Prosperity on State Route 4, Raleigh County. (High shale subsoil.)	Shale	66-0-94 66-0-102	15-24 35-52	100 98	22 20
[S65WVA 10-3(1-2)] 1.3 miles E. of Layland on State Route 4/13, Fayette County. (Coarse substrata.)	Shale	66-0-79 66-0-86	8-19 33-42	97 107	23 17

[1] Based on AASHO Designation: T 99-57, Methods A and C (*2*).

[2] Mechanical analysis according to the AASHO Designation: T 88-57 (*2*). Results by this procedure differ somewhat from the results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain sizes are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from the calculation of grain-size fractions. The mechanical analyses used in this table are not suitable for naming USDA textural classes for soils.

test data

Soil Conservation Service, Lincoln, Nebraska]

Mechanical analysis [3]								Liquid limit	Plasticity index	Classification	
Percentage [3] passing sieve—				Percentage smaller than—							
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.	*Pct.*		AASHO	Unified [4]
81	81	78	40	35	32	18	13	20	3	A-4	SM-SC
60	60	58	25	21	19	12	7	17	2	A-2-4(0)	GM
91	88	80	41	36	29	16	8	21	1	A-4	SM-SC
81	78	70	26	20	14	9	5	[5] NP	[5] NP	A-2-4(0)	SM-SC
73	72	66	25	20	18	9	6	NP	NP	A-2-4(0)	SM-SC
98	92	86	79	76	59	29	16	41	10	A-5	ML
91	84	81	77	72	63	40	25	45	15	A-7-6(11)	ML
93	84	79	75	68	59	34	20	42	14	A-7-6(9)	ML-CL
------	100	97	79	72	63	43	32	45	15	A-7-5(11)	ML
------	100	98	75	68	58	40	27	46	18	A-7-6(12)	ML-CL
------	100	98	72	64	54	37	26	38	12	A-6(7)	ML-CL
------	------	------	86	82	74	50	39	52	23	A-7-6(15)	MH or CH
------	------	------	86	82	73	53	39	57	24	A-7-5(17)	MH
96	92	88	67	61	47	25	15	32	7	A-4(6)	ML-CL
85	81	77	67	62	55	36	25	42	16	A-7-6(9)	ML-CL
83	72	69	66	65	61	39	27	51	20	A-7-5(12)	MH
85	83	80	78	71	56	32	22	38	11	A-6(8)	ML-CL
75	74	71	69	64	49	29	17	37	13	A-6(8)	ML-CL
85	70	67	66	64	59	36	22	45	17	A-7-6(10)	ML-CL
56	45	42	41	39	37	24	14	47	21	A-7-6(4)	GC
97	91	83	79	77	68	46	28	51	13	A-7-5(11)	MH
------	------	------	95	95	92	82	58	66	35	A-7-6(20)	CH or MH
------	------	------	------	100	98	86	58	67	33	A-7-5(20)	MH or CH
------	------	------	88	86	78	58	42	51	22	A-7-6(15)	MH or CH
------	------	------	------	100	95	69	45	54	25	A-7-6(16)	CH or MH
95	81	76	74	74	69	47	29	48	17	A-7-5(12)	ML
------	------	------	96	95	77	40	24	41	18	A-7-6(11)	CL

[3] Based on total material. The laboratory test data have been corrected for fragments larger than 3 inches discarded during the field sampling. In the Dekalb very stony loam (modal), these fragments make up 5 percent, by weight, of the material in the 8- to 21-inch horizon and 10 percent of the material in the 21- to 33-inch horizon.

[4] Based on MIL-STD-619B (*16*). SCS and the Bureau of Public Roads have agreed to consider that soils having plasticity index within 2 points of the A-line are to be given borderline classification. Examples of borderline classifications obtained by this use are ML-CL and SM-SC.

[5] NP=Nonplastic. The plastic limit equals or exceeds the liquid limit or the test cannot be performed.

Shrink-swell potential is a rating of the ability of soil material to change volume when subjected to changes in moisture. Those soil materials rated *high* are normally undesirable from the engineering standpoint, since the increase in volume when the dry soil is wetted is accompanied by heave or pressures on retaining walls that frequently result in structural cracking and failure. In general, soils classed as CH and A–7 have a high shrink-swell potential. Clean sands and gravels (single-grain structure) and soils having small amounts of nonplastic to slightly plastic fines have a low shrink-swell potential.

Engineering interpretations

Table 7 rates the soils according to their suitability as a source of material for topsoil and road fill. It also names soil features that affect engineering uses for the construction and location of highways, for the construction and maintenance of pipelines, and for selected farm engineering practices.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. The ratings *good*, *fair*, or *poor* indicate suitability for such use. For ratings other than good, major soil limitations are given. Such soil factors as natural fertility, erodibility, thickness, depth to water table, and presence of stones are important in making the ratings.

Road fill is material used to build embankments. The ratings *good*, *fair*, or *poor* indicate performance of soil material moved from borrow areas for these purposes. In general, a sandy material that contains adequate binder is best for road fill, and plastic clays or organic materials are the poorest. Texture, compaction characteristics, stability, erodibility, and depth to the water table are among the factors considered in making ratings.

Highway location is influenced by features of the undisturbed soil that affect construction and maintenance of highways. The soil features, favorable as well as unfavorable, are the principal ones that affect geographic location of highways. Soil features that affect highway location, such as depth to bedrock, depth to water table, and hazard of flooding, are shown in table 7.

Farm pond reservoir areas are affected mainly by seepage loss of water, and the soil features are those that influence such seepage. Such soil features as texture, slope, presence of stones, depth to and permability of substrata, and hazard of flooding are important to this use.

Farm pond embankments serve as dams. The soil features of both subsoil and substratum are those important to the use of soils for constructing embankments. Stability of the soil material, compaction characteristics, erodibility, and presence of stones are important to this use of soil material.

Drainage for crops and pasture is affected by permeability, a high water table, flooding, and the availability of outlets. Generally, moderately well drained soils, such as the Monongahela soils, need only spot drainage, whereas poorly drained soils, such as the Atkins soils, need more complete drainage.

Terraces or diversions are needed on some soils in the county. On long slopes they help control runoff, and at the base of slopes they are useful in diverting water away from more level land. Slopes, depth to bedrock, and suitable outlets should be considered in planning these practices.

Pipeline construction and maintenance are affected by depth to bedrock, slip hazards, erodibility, and water tables.

No reliable sources of sand and gravel are in the two counties, although small variable deposits are in some places under the Pope soils and Alluvial land. Extensive deposits of sandstone suitable for crushing for road aggregates and other construction uses occur under the Dekalb soils.

Engineering test data

To help evaluate the soils of Fayette and Raleigh Counties for engineering purposes, 11 soil samples were tested according to standard procedures of the American Association of State Highway Officials (AASHO) (*2*). The results of these tests are given in table 8. The samples represent two of the major upland series, Dekalb and Gilpin; an upland soil of lesser extent, in the Wharton series; and the dominant colluvial foot-slope soil in the Ernest series.

Moisture density, the relation of moisture content and density to which a soil is compacted, is given in table 8. As a soil material is compacted, with an increase in moisture content, and assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. The highest dry density obtained in the standard compaction test is termed maximum dry density. The soil is most efficiently compacted to a given dry density when at its optimum moisture content.

The liquid limit and plasticity index given in table 8 indicate the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Use of the Soils for Town and Country Planning

The use of soils in town and country planning is becoming more extensive and important in Fayette and Raleigh Counties. Sound planning is vital to the success of individual enterprises and probably is even more important in community or county planning. The facts and interpretations in this section can provide information useful in such planning and establishment.

Table 9 lists the limitations of the soils of Fayette and Raleigh Counties for several major components of town and country planning. For each of these uses, the soils are rated in terms of the degree of limitation—*slight*, *moderate*, or *severe*. The degree of limitation indicates the severity of problems expected to be encountered for

the specified use. Major limiting factor or factors also are listed for a soil that has a moderate or severe rating. A rating of slight indicates few known limitations, or limitations that are easy to overcome for use indicated. Moderate indicates limitations that can normally be overcome with correct planning, careful design, and good management. Severe indicates one or more soil properties that seriously limit use. Using soils that have a severe limitation increases the probability of failure and adds to the cost of installation and maintenance.

The decision as to whether or not a soil will be used for a specific purpose, regardless of the limitations, is beyond the scope of the information given here. At a price, almost any limitation can be overcome to a greater or lesser degree (fig. 7).

The user is cautioned that the information given is for the dominant soil as shown on the soil map. Inclusions of small areas of different kinds of soil occur because of the scale of mapping and the natural variation of soils. Detailed field investigations are needed to determine the in-place condition of the soil at the exact site of the proposed construction.

The ratings for town and country planning given in table 9 and the soil properties affecting them are discussed in the following paragraphs.

Sewage effluent disposal fields.—Septic tank filter fields work with difficulty in soils that are shallow over bedrock, are slowly permeable, have slopes of more than 10 percent, have a high water table, or are subject to flooding. Soils having slight limitations are generally well suited to filter fields. Soils rated moderate are less well suited, and larger filter fields are more commonly needed than on soils having slight limitations. Soils rated severe may be unsuitable, and they should be thoroughly investigated before planning a septic disposal field. The hazard of aquifer pollution and the risk of polluting water supplies need to be considered on soils that have moderately rapid permeability in the underlying material, such as the Chavies soils.

Impoundments and sewage lagoons.—Impoundments considered are generally more than one-half acre in size and may be used for swimming, fishing, ice skating, and other forms of recreation. Sewage lagoons are shallow ponds built to dispose of sewage through oxidation. They may be practical in some areas where septic tanks and sewage systems are not feasible. The soil restrictions and limitations for these uses are about the same as for farm ponds (see table 7 in the section "Engineering Uses of the Soils"). Slope, soil depth, permeability, and hazard of flooding are important properties to consider. Soils that are sandy, underlain by sand and gravel, or shallow over bedrock have severe limitations.

***Figure 7.*—Atkins silt loam has a severe limitation for building locations and homesites.**

TABLE 9.—*Estimated degree and kind of*

[Slight indicates few or no limitations, moderate indicates

Soil series and map symbols	Sewage effluent disposal fields	Impoundments and sewage lagoons	Building locations and homesites of 3 stories or less	Camp areas
Alluvial land: Ad	Severe: flooding; seasonal water table at depth of 0 to 3 feet.	Severe: flooding	Severe: flooding; seasonal water table at depth of 0 to 3 feet.	Severe: flooding; seasonal water table at depth of 0 to 3 feet.
Ashton: As	Moderate: infrequent flooding.	Moderate to severe: sandy layers in substratum; infrequent flooding.	Severe: infrequent flooding.	Slight.
Atkins: At	Severe: flooding; seasonal water table at surface; moderately slow permeability.	Severe: flooding	Severe: flooding; seasonal water table at surface.	Severe: flooding; seasonal water table at surface.
Brinkerton: Br	Severe: seasonal water table at depth of ½ to 1 foot; slow permeability.	Moderate: slope	Severe: seasonal water table at depth of ½ to 1 foot.	Severe: seasonal water table at depth of ½ to 1 foot; slow permeability.
Calvin:				
CaC	Severe: bedrock at depth of 2 to 2½ feet; slope.	Severe: bedrock at depth of 2 to 2½ feet; slope.	Severe: bedrock at depth of 2 to 2½ feet.	Moderate: slope
CaD, CaD3, CaE, CaE3, CaF, CaF3.[1]	Severe: bedrock at depth of 2 to 2½ feet; slope.	Severe: bedrock at depth of 2 to 2½ feet; slope.	Severe: bedrock at depth of 2 to 2½ feet; slope.	Severe: slope
CgC [1]	Severe: slope	Severe: slope	Severe: bedrock at depth of 2 to 2½ feet.	Moderate: slope; stones.
CgE, CgF [1]	Severe: slope	Severe: slope	Severe: bedrock at depth of 2 to 2½ feet.	Severe: slope
Chavies: Ch	Moderate: infrequent flooding.	Moderate to severe: sandy layers in substratum; infrequent flooding.	Severe: infrequent flooding.	Slight.
Clymer:				
ClB	Moderate: bedrock at depth of 3½ to 5 feet; slope.	Moderate: bedrock at depth of 3½ to 5 feet; slope.	Moderate: bedrock at depth of 3½ to 5 feet.	Slight.
ClC	Severe: slope	Severe: slope	Moderate: bedrock at depth of 3½ to 5 feet; slope.	Moderate: slope
Cookport: CpB	Severe: moderately slow permeability; seasonal water table at depth of 1½ to 2 feet; bedrock at depth of 3½ to 4 feet.	Moderate: bedrock at depth of 3½ to 4 feet; slope.	Moderate: bedrock at depth of 3½ to 4 feet; seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet; moderately slow permeability.

See footnotes at end of table.

limitations for town and country planning

some limitations, and severe indicates serious limitations]

Picnic areas	Streets and low-cost roads	Playgrounds	Paths and trails	Lawns and landscaping
Severe: flooding; seasonal water table at depth of 0 to 3 feet.	Severe: flooding	Severe: flooding; seasonal water table at depth of 0 to 3 feet.	Severe: seasonal water table at depth of 0 to 3 feet.	Severe: seasonal water table at depth of 0 to 3 feet.
Slight	Moderate: infrequent flooding	Slight	Slight	Slight.
Severe: seasonal water table at surface.	Severe: flooding; seasonal water table at surface.	Severe: flooding; seasonal water table at surface.	Severe: seasonal water table at surface.	Severe: flooding; seasonal water table at surface.
Severe: seasonal water table at depth of ½ to 1 foot.	Severe: low shear strength; seasonal water table at depth of ½ to 1 foot.	Severe: seasonal water table at depth of ½ to 1 foot.	Moderate: seasonal water table at depth of ½ to 1 foot.	Moderate: seasonal water table at depth of ½ to 1 foot.
Moderate: slope	Severe: bedrock at depth of 2 to 2½ feet.	Severe: slope	Slight	Moderate: bedrock at depth of 2 to 2½ feet; slope.
Severe: slope	Severe: bedrock at depth of 2 to 2½ feet; slope.	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope	Severe: bedrock at depth of 2 to 2½ feet; slope.	Severe: slope	Slight	Severe: slope.
Severe: slope	Severe: bedrock at depth of 2 to 2½ feet; slope.	Severe: slope	Severe: slope	Severe: slope.
Slight	Moderate: infrequent flooding.	Slight	Slight	Slight.
Slight	Moderate: bedrock at depth of 3½ to 5 feet.	Moderate: slope	Slight	Slight.
Moderate: slope	Severe: slope	Severe: slope	Slight	Moderate: slope.
Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet; bedrock at depth of 3½ to 4 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet; slope.	Slight	Slight.

TABLE 9.—*Estimated degree and kind of*

Soil series and map symbols	Sewage effluent disposal fields	Impoundments and sewage lagoons	Building locations and homesites of 3 stories or less	Camp areas
Dekalb:				
DbB	Severe: bedrock at depth of 2 to 3 feet.	Severe: bedrock at depth of 2 to 3 feet; pervious material.	Severe: bedrock at depth of 2 to 3 feet.	Slight.
DbC	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope; pervious material.	Severe: bedrock at depth of 2 to 3 feet.	Moderate: slope.
DcD	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope; pervious material.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope.
DcE	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope; pervious material.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope.
DsC [3]	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope; pervious material.	Severe: bedrock at depth of 2 to 3 feet; slope.	Moderate: slope; stones.
DsE, DsF [3]	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope; pervious material.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope.
Ernest:				
ErB	Severe: moderately slow permeability; seasonal water table at depth of 1½ to 2 feet.	Moderate: slope.	Moderate: seasonal water table at depth of 1½ to 2 feet; seeps.	Moderate: seasonal water table at depth of 1½ to 2 feet; moderately slow permeability; seeps.
ErC	Severe: moderately slow permeability; seasonal water table at depth of 1½ to 2 feet; slope.	Severe: slope.	Moderate: seasonal water table at depth of 1½ to 2 feet; slope; slips; seeps.	Moderate: moderately slow permeability; seasonal water table at depth of 1½ to 2 feet; slope.
EsC [3]	Severe: moderately slow permeability; seasonal water table at depth of 1½ to 2 feet; slope.	Severe: slope.	Moderate: seasonal water table at depth of 1½ to 2 feet; slope; stones.	Moderate: slope; stones.
EsE [3]	Severe: moderately slow permeability; seasonal water table at depth of 1½ to 2 feet; slope.	Severe: slope.	Severe: seasonal water table at depth of 1½ to 2 feet; slope.	Severe: slope.
Gilpin:				
GlB	Severe: bedrock at depth of 2 to 3 feet.	Severe: bedrock at depth of 2 to 3 feet.	Severe: bedrock at depth of 2 to 3 feet.	Slight.
GlC, GlC3	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet.	Moderate: slope.
GlD, GlD3	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet.	Severe: slope.
GlE, GlE3, GlF, GlF3.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet.	Severe: slope.
Gravelly alluvial land: Gr.	Severe: flooding; seasonal water table below depth of 3 feet.	Severe: flooding; pervious substratum.	Severe: flooding.	Severe: flooding.
Landes: La	Severe: flooding.	Severe: flooding; sandy layers.	Severe: flooding.	Severe: flooding.

See footnotes at end of table.

limitations for town and country planning—Continued

Picnic areas	Streets and low-cost roads	Playgrounds	Paths and trails	Lawns and landscaping
Slight	Severe: bedrock at depth of 2 to 3 feet.	Moderate: bedrock at depth of 2 to 3 feet.	Slight	Moderate: bedrock at depth of 2 to 3 feet.
Moderate: slope	Severe: bedrock at depth of 2 to 3 feet.	Severe: slope	Slight	Moderate: bedrock at depth of 2 to 3 feet; slope.
Severe: slope	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope	Moderate: slope	Severe: slope.
Severe: slope	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope	Severe: slope	Severe: slope.
Moderate: slope	Severe: bedrock at depth of 2 to 3 feet.	Severe: slope	Moderate: stones	Moderate: bedrock at depth of 2 to 3 feet; slope; stones.
Severe: slope	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope	Severe: slope	Severe: slope.
Moderate: seasonal water table at depth of 1½ to 2 feet; seeps.	Moderate: seasonal water table at depth of 1½ to 2 feet; seeps.	Moderate: seasonal water table at depth of 1½ to 2 feet; slope.	Slight	Slight.
Moderate: seasonal water table at depth of 1½ to 2 feet; slope.	Moderate: seasonal water table at depth of 1½ to 2 feet.	Severe: slope	Slight	Moderate: slope.
Moderate: seasonal water table at depth of 1½ to 2 feet; slope.	Moderate: seasonal water table at depth of 1½ to 2 feet; slope.	Severe: slope	Moderate: stones	Moderate: slope; stones.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Severe: bedrock at depth of 2 to 3 feet.	Moderate: bedrock at depth of 2 to 3 feet; slope.	Slight	Moderate: bedrock at depth of 2 to 3 feet.
Moderate: slope	Severe: bedrock at depth of 2 to 3 feet.	Severe: slope	Slight	Moderate: bedrock at depth of 2 to 3 feet; slope.
Severe: slope	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope	Moderate: slope	Severe: slope.
Severe: slope	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope	Severe: slope	Severe: slope.
Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding	Severe: flooding.
Slight	Severe: flooding	Slight	Slight	Moderate: flooding.

TABLE 9.—*Estimated degree and kind of*

Soil series and map symbols	Sewage effluent disposal fields	Impoundments and sewage lagoons	Building locations and homesites of 3 stories or less	Camp areas
Lickdale: Lc	Severe: seasonal water table at surface; slow permeability.	Slight	Severe: seasonal water table at surface.	Severe: seasonal water table at surface; slow permeability.
Made land: Ma. Too variable to be rated.				
Meckesville:				
McB	Moderate: slope	Moderate: slope	Slight	Slight
McC	Severe: slope	Severe: slope	Moderate: slope	Moderate: slope
MdC	Severe: slope	Severe: slope	Moderate: slope; stones.	Moderate: slope; stones.
MdE	Severe: slope; stones	Severe: slope	Severe: slope	Severe: slope
Mine dump: Me. Too variable to be rated.				
Monongahela:				
MgA	Severe: moderately slow permeability; seasonal water table at depth of 1½ to 2 feet.	Moderate: contains sandy layers in places.	Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet; moderately slow permeability.
MgB	Severe: moderately slow permeability; seasonal water table at depth of 1½ to 2 feet.	Moderate: contains sandy layers in places; slope.	Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet; moderately slow permeability.
Muskingum:				
MkC, MkC3	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet.	Severe: bedrock at depth of 2 to 3 feet; slope.	Moderate: slope
MkD, MkD3	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope
MkE, MkE3, MkF, MnE, MnF.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope
Philo: Ph	Severe: flooding; seasonal water table at depth of 1½ to 2 feet.	Severe: flooding; pervious substratum.	Severe: flooding	Severe: flooding
Pope: Po	Severe: flooding	Severe: flooding; pervious substratum.	Severe: flooding	Severe: flooding
Rayne:				
RaB	Moderate: slope	Moderate: bedrock below depth of 3½ feet; slope.	Moderate: bedrock below depth of 3½ feet.	Slight
RaC	Severe: slope	Severe: slope	Moderate: bedrock below depth of 3½ feet; slope.	Moderate: slope
Shelocta:				
ShC	Severe: slope	Severe: slope	Moderate: slope	Moderate: slope
ShD, ShE	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Steep rock land: Sr	Severe: slope; rocks	Severe: slope; rocks	Severe: slope; rocks	Severe: slope; rocks
Strip mine spoil: St. Too variable to be rated.				

See footnotes at end of table.

limitations for town and country planning—Continued

Picnic areas	Streets and low-cost roads	Playgrounds	Paths and trails	Lawns and landscaping
Severe: seasonal water table at surface.	Severe: seasonal water table at surface.	Severe: seasonal water table at surface.	Severe: seasonal water table at surface.	Severe: seasonal water table at surface.
Slight	Slight	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope.
Moderate: slope	Moderate: slope	Severe: slope	Moderate: stones	Moderate: slope; stones.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet.	Slight.
Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet; slope.	Moderate: seasonal water table at depth of 1½ to 2 feet.	Slight.
Moderate: slope	Severe: bedrock at depth of 2 to 3 feet.	Severe: slope	Slight	Moderate: bedrock at depth of 2 to 3 feet.
Severe: slope	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope	Moderate: slope	Severe: slope.
Severe: slope	Severe: bedrock at depth of 2 to 3 feet; slope.	Severe: slope	Severe: slope	Severe: slope.
Severe: seasonal water table at depth of 1½ to 2 feet.	Severe: flooding	Severe: flooding; seasonal water table at depth of 1½ to 2 feet.	Moderate: flooding; seasonal water table at depth of 1 to 2½ feet.	Moderate: flooding.
Slight	Severe: flooding	Moderate: flooding	Moderate: flooding	Moderate: flooding.
Slight	Moderate: bedrock below depth of 3½ feet.	Moderate: slope	Slight	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope; stones.
Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: slope; rocks	Severe: slope; rocks	Severe: slope; rocks	Severe: slope; rocks	Severe: slope; rocks.

TABLE 9.—*Estimated degree and kind of*

Soil series and map symbols	Sewage effluent disposal fields	Impoundments and sewage lagoons	Building locations and homesites of 3 stories or less	Camp areas
Summers: SuB	Severe: bedrock at depth of 2 to 3 feet.	Severe: bedrock at depth of 2 to 3 feet; pervious material.	Severe: bedrock at depth of 2 to 3 feet.	Slight.
Wharton:				
WhB	Severe: seasonal water table at depth of 1½ to 2 feet; slow permeability.	Moderate: slope.	Moderate: seasonal water table at depth of 1½ to 2 feet; bedrock below depth of 4 feet; moderate shrink-swell potential.	Moderate: seasonal water table at depth of 1½ to 2 feet; slow permeability.
WhC, WhC3	Severe: seasonal water table at depth of 1½ to 2 feet; slow permeability; slope.	Severe: slope.	Moderate: seasonal water table at depth of 1½ to 2 feet; bedrock below depth of 4 feet; moderate shrink-swell potential; slope.	Moderate: seasonal water table at depth of 1½ to 2 feet; slow permeability; slope.

[1] Limitations of Gilpin soils mapped with Calvin soils are the same as those of the Calvin soils.
[2] Limitations of Gilpin soils mapped with Dekalb soils are the same as those of the Dekalb soils.

Building locations and homesites.—Slope, depth to water table, slip and flood hazards, and depth to bedrock are soil properties that affect building locations and homesites. Buildings considered are three stories or less with basements. If basements are not planned, depth to bedrock and depth to water table would be less restrictive.

Camp areas.—Sites should be large enough for level tent and trailer pads, fireplaces, and parking places, and large enough for privacy. Slope, natural drainage, flooding, and soil texture are properties considered in rating soils for camp areas.

Picnic areas.—Natural drainage, flooding, slope, soil texture, and stoniness were considered in rating soils for use as park-type picnic areas.

Streets and low-cost roads.—Soil requirements and limitations for streets and low-cost roads are similar to those for highways (see tables 6 and 7 in the section "Engineering Uses of the Soils"). The ratings do not apply to concrete roads. Table 6 shows the depth to seasonal high water table, depth to bedrock, and the shrink-swell potential for each soil in the survey area. Table 7 shows the suitability of each soil for road fill and the limitations that affect highway location, and gives the susceptibility to frost action. Slope and hazard of flooding are also factors that affect the location of streets and low-cost roads.

Playgrounds.—These are generally small, nearly level areas used for football, baseball, and other athletic field events. Because nearly level areas are needed, considerable grading and land shaping are generally required. Depth to bedrock, slope, depth to water table, and hazard of flooding are factors that affect the suitability of soils for athletic fields.

Paths and trails.—Ratings apply to soils in areas to be used for local and cross-country footpaths and trails for bridle paths. The areas are essentially undisturbed insofar as land surfaces are concerned. Slope, texture, high water table, and hazard of flooding are factors that affect extensive play areas. Limitations are less severe for these than for more intensive uses, such as athletic fields.

Lawns and landscaping.—Soil properties should be such that, with the necessary additions of lime and fertilizer, lawns can be easily established and maintained. Soil depth, texture, slope, droughtiness, depth to water table, and stoniness are properties that affect lawn establishment and maintenance of shrubs and ornamentals used in landscaping.

Formation, Morphology, and Classification of the Soils

In this section the major factors of soil formation are discussed in terms of their effect on the development of the soils in Fayette and Raleigh Counties. Morphology of soils is discussed as relating to horizon nomenclature and the process involved in horizon development. Then the current system of soil classification is briefly described and the soils in the two counties are classified by higher categories.

Factors of Soil Formation

Soils form through the interaction of the five major factors—climate, living organisms, parent material, topography, and time. The relative influence of each factor usually varies from place to place. Local variations in soils are the result of differences in kind of parent materials, topography, and drainage. In some areas one or two factors may dominate the formation of a soil and determine most of its properties.

Climate

Climate affects the formation of soils through its influence on the rate of weathering of rocks and decompo-

limitations for town and country planning—Continued

Picnic areas	Streets and low-cost roads	Playgrounds	Paths and trails	Lawns and landscaping
Slight	Severe: bedrock at depth of 2 to 3 feet.	Moderate: bedrock at depth of 2 to 3 feet.	Slight	Moderate: bedrock at depth of 2 to 3 feet.
Moderate: seasonal water table at depth of 1½ to 2 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet; bedrock below depth of 4 feet.	Moderate: seasonal water table at depth of 1½ to 2 feet; slope.	Slight	Slight.
Moderate: seasonal water table at depth of 1½ to 2 feet; slope.	Moderate: seasonal water table at depth of 1½ to 2 feet; bedrock below depth of 4 feet.	Severe: slope	Slight	Moderate: slope.

[3] Limitations of Shelocta soils mapped with Ernest soils, except for permeability and depth to seasonal water table, are the same as those of the Ernest soils.

sition of minerals and organic matter. It also affects biological activity in the soils and the leaching and movement of weathered materials.

Fayette and Raleigh Counties have a characteristically humid, continental type of climate that is marked by sharp seasonal temperature changes. The annual precipitation is about 45 inches, and the mean annual air temperature is about 51° F. The rainfall is fairly uniform throughout the year. Summer temperatures average about 68° and winter temperatures about 36° F. Differences in temperature throughout the two counties are relatively small. Areas below 1,500 feet in elevation are about 5° warmer than the average, and mountainous areas of more than 3,000 feet are correspondingly cooler. Snowfall and total precipitation are above average in the mountainous areas.

Climate, however, does not vary enough in the survey area to account for all the differences among the soils. The climate tends to develop strongly weathered, leached, acid soils that are low to moderate in fertility. This leaching has prevented any appreciable accumulation of bases in all except a few of the soils. For more detailed information, see the subsection "Climate" in the section "General Nature of the Area."

Living organisms

All living organisms are important to soil formation. These include vegetation, animals, bacteria, and fungi. The vegetation is generally responsible for the amount of organic matter and the color of the surface layers, and it influences the amount of nutrients in soils. The soils in the survey area formed under hardwood trees and have only a thin surface layer of organic accumulation. Earthworms, cicada, burrowers, and other animals help to keep the soils open and porous. Bacteria and fungi, through decomposition of vegetation, cause many beneficial changes in the soil, such as the release and leaching of elements, aggregation, aeration, and better moisture content.

Parent material

In Fayette and Raleigh Counties, a very large proportion of the soils formed in residual material derived from interbedded acid shale, siltstone, and sandstone. These soils are mostly steep and very steep on side slopes, but they are also gently sloping to sloping on plateau ridges. A small, dissected region in the eastern edge of the survey area has soils that formed in residual material derived from reddish shale and siltstone, some of which are limy. Small acreages of soils throughout the survey area also formed in colluvial material and in alluvial material making up stream terraces and bottom lands.

Residual parent materials are predominantly from interbedded acid shale, siltstone, and sandstone of Pennsylvanian age (*6, 7*). These rocks contain coal seams of varying thickness. Muskingum, Rayne, and Dekalb soils formed in these moderately fine textured to moderately coarse textured materials. The Wharton soils formed in fine-textured material derived from the clay shale that is close to the coal seams. Small amounts of red and gray shale of Mississippian age occur in the eastern edge of both counties. Gilpin and Calvin soils formed in the medium-textured to moderately fine textured, acid and limy material weathered from these rocks.

Colluvial materials occur on foot slopes below uplands and are underlain mostly by acid sandstone, siltstone, and shale. These materials are medium textured to moderately fine textured and commonly contain small fragments of stone throughout. They receive underground and surface water from higher slopes. Shelocta, Ernest, Brinkerton, and Lickdale soils formed in these materials. Meckesville soils are below the upland soils underlain by red and gray shale and siltstone that have some limy layers.

The older alluvial materials washed from upland soils underlain by acid shale, siltstone, and sandstone are of minor extent. These materials are commonly medium textured to moderately fine textured, and they occur as

terraces along the larger streams of the two counties. The Monongahela soils formed in these materials.

Recent alluvium washed from upland soils underlain by acid shale, siltstone, and sandstone occurs on flood plains along the rivers, streams, and intermittent drainageways of the survey area. This material is medium textured to moderately coarse textured. Chavies, Pope, Philo, and Atkins soils and Alluvial land formed in this material. Small areas of medium-textured to coarse-textured, acid Gravelly alluvial land are along streams that have steep gradients below the sandstone and shale uplands. The recently deposited alluvial material along the New River has been influenced by limestone in the upper reaches of the river. This material is medium textured to moderately coarse textured and is slightly acid to neutral. Ashton and Landes soils formed in this material.

Topography

The shape of the land, the lay of the land, the slope, and the position in relation to the water table have influenced the formation of soils in the survey area. Soils formed in steep and very steep areas, where runoff is excessive and movement of soil material by creep is appreciable, have a weakly developed profile. Some soils that formed on gentle upland slopes show no characteristics associated with wetness. This generally can be attributed to moderate permeability and adequate drainage through the shale or sandstone bedrock. Other soils on gentle upland slopes, however, do show some characteristics associated with wetness because of the seasonal high water table caused by a fragipan or claypan layer. On gently sloping or level soils on foot slopes and stream flood plains, where the water table is at or near the surface for long periods, some soils show a marked evidence of wetness. These soils have a grayish-brown surface layer and a strongly mottled or grayish subsoil. Thus, the length, steepness, and configuration of the slopes influence the characteristics of the kind of soil that is formed from place to place. Local differences in soils are largely the result of differences in parent material and topography. In table 10 soil series of the area are arranged to show topographic position, parent material, drainage, and depth.

Time

The formation of soils requires time for changes to take place in the parent materials, and this is usually a long time when measured in years. The soils in Fayette and Raleigh Counties range from young soils on stream flood plains to old soils on gently sloping uplands. Soils that formed in flood plains can receive new sediment with each flooding. These soils have weak soil structure and slight color differences between horizons. An example is the Pope soils. In steep areas, soil material may be removed by creep, washing, or mixing by solifluction before it has time to form a distinct profile. Dekalb soils are common on such slopes.

In smooth upland areas, the parent material is relatively stable, and its removal is slow. Therefore, the soil-forming factors have a long time to act on these materials. As a result, mature soils that have distinct genetic horizons, such as Clymer and Rayne soils, have formed.

Morphology of the Soils

This subsection briefly describes horizon nomenclature and the processes involved in horizon differentiation.

TABLE 10.—*Relationship of topographic position and parent material to drainage and depth of soils*

[Dashed lines indicate that there is no series of this drainage class in the survey area]

Topographic position and parent material	Well-drained soils: Moderately deep	Well-drained soils: Deep	Moderately well drained, deep soils	Poorly drained, deep soils	Very poorly drained, deep soils
Uplands: Residuum derived from—					
Acid sandstone	Dekalb, Summers	Clymer	Cookport	----	----
Acid shale, siltstone, and sandstone	Gilpin, Muskingum.	Rayne	Wharton	----	----
Acid reddish siltstone and shale	Calvin	----	----	----	----
Colluvial slopes: Colluvium derived from—					
Acid gray shale, siltstone, and sandstone.	----	Shelocta	Ernest	Brinkerton	Lickdale.
Acid reddish and gray siltstone, shale, and sandstone.	----	Meckesville	----	----	----
Stream terraces: Old, medium-textured to moderately fine textured alluvium derived from shale, siltstone, and sandstone.	----	----	Monongahela	----	----
Flood plains: Recent alluvium derived from—					
Limestone, shale, and sandstone	----	Landes, Ashton [1]	----	----	----
Acid shale, siltstone, and sandstone	----	Pope, Chavies [1]	Philo	Atkins	----

[1] These soils occur on high bottoms subject to infrequent flooding.

Major soil horizons

The results of the soil-forming factors can be distinguished by the different layers, or soil horizons, seen in a soil profile. The soil profile extends from the surface of the land downward to materials that are little altered by the soil-forming processes.

Most soils contain three major horizons, called A, B, and C. These major horizons can be further subdivided by the use of subscripts and letters to indicate changes within one horizon. An example would be the B2t horizon, which represents a layer within the B horizon that has translocated clay illuviated from the A horizon.

The A horizon is the surface layer. It is the layer that has the largest accumulation of organic matter. The dark upper part is called an A1 horizon. The A horizon is also the layer of maximum leaching, or eluviation of clay and soluble minerals. When considerable leaching has taken place, an A2 horizon is formed, normally in the lower part of the A horizon. In cultivated areas, the A horizon has been mixed by plowing and is designated as an Ap horizon.

The B horizon lies underneath the A horizon and is commonly called the subsoil layer. It is the horizon of maximum accumulation, or illuviation of clay, iron, aluminum, or other compounds, leached from the A horizon. In some soils the B horizon is formed by alteration in place rather than from illuviation. The alteration may be due to oxidation and reduction of iron or the weathering of clay minerals. The B horizon is generally firmer, has blocky or prismatic structure, and is generally lighter colored than the A1 horizon but darker colored than the C horizon.

The C horizon is below the A or B horizon. It consists of materials that are little altered by the soil-forming processes but may be modified by weathering.

Processes of soil horizon differentiation

Several processes are involved in the formation of horizons in the soils of the survey area. These include the accumulation of organic matter, the leaching of soluble salts, the formation and translocation of clay minerals, and the reduction and transfer of iron. These processes are continually taking place, generally at the same time throughout the profile. They are measured in thousands of years.

The accumulation of organic matter takes place with the decomposition of plant residue. This process darkens the surface layer and helps form the A1 horizon. Organic matter, once it has been lost, takes a long time to replace. The surface layer of tilled soils in the survey area averages about 1.0 to 1.5 percent organic-matter content. A thin A1 horizon in woods commonly has 4.5 to 6.0 percent organic matter.

In order for soils to have distinct soil horizons, some of the calcium and other soluble salts are leached before the translocation of clay minerals. Many factors affect this leaching, such as major vegetation, the kinds of salts originally present, the depth to which the soil solution percolates, and the texture and structure of the soil profile.

The most important process of soil-horizon formation in the survey area is the formation and translocation of silicate clay minerals. The amount of clay minerals in a soil profile is inherent to the parent material, but amounts of clay vary from one soil horizon to another. Clay minerals are generally eluviated from the A horizon and illuviated into the B horizon as clay films on ped faces and in pores and root channels. In some soils, an A2 horizon has been formed by considerable eluviation of clay minerals to the B horizon. The A2 horizon is light colored and in places has weak, platy structure. The Rayne soils are an example of clay mineral translocation.

The reduction and transfer of iron is associated mainly with the wetter, more poorly drained soils. This process is called gleying. Moderately well drained soils have yellowish-brown, strong-brown, reddish-brown, or yellowish-red mottles, indicating segregation of iron. Very poorly drained soils, such as Lickdale, have a subsoil and underlying material that are grayish colored, indicating reduction and transfer of iron.

Classification of the Soils

Soils are classified so that we may more easily remember their significant characteristics, assemble knowledge about them, see their relationships to one another and to the whole environment, and develop principles that help us understand their behavior and response to manipulation. First through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The current system of soil classification defines soils in terms of observable or measurable properties (*12*, *15*). This system was adopted for general use by the National Cooperative Soil Survey in 1965 and supplemented in March, 1966. It is under constant study; therefore, readers interested in the development of the system should search for the latest revisions. The properties chosen are primarily those that permit the grouping of soils that are similar in genesis. The classification is designed to accommodate all soils.

The classification has six categories. Beginning with the broadest, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. In table 11, the soils of Fayette and Raleigh Counties are placed in some of these categories. Following are brief descriptions of each of the six categories in the system.

ORDER.—Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. The exceptions to this are the Entisols, Histosols, and, to some extent, Inceptisols, which occur in many different climates. Each order is named with a word of three or four syllables ending in sol (Ult-i-*sol*).

Table 11 shows the five soil orders in Fayette and Raleigh Counties—Entisols, Inceptisols, Mollisols, Alfisols, and Ultisols.

Entisols are essentially recent or very young soils. They have been very slightly modified from the material in which they formed. In Fayette and Raleigh Counties the principal modification is color.

Inceptisols are soils that have genetic horizons beginning to develop. Their name is derived from the Latin *inceptum*, for beginning. These soils have not progressed far enough toward maturity to have formed horizons of

TABLE 11.—*Soil series classified according to two systems*

Soil series	Classification according to current system [1]			Classification according to 1938 system—Great soil group
	Family	Subgroup	Order	
Ashton	Fine-silty, mixed, mesic	Mollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Alluvial soils.
Atkins	Fine-loamy, mixed, acid, mesic	Typic Fluvaquents	Entisols	Low-Humic Gley soils.
Brinkerton	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Alfisols	Low-Humic Gley soils.
Calvin	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Chavies [2]	Coarse-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Alluvial soils.
Clymer	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Brown Podzolic soils.
Cookport	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols	Red-Yellow Podzolic soils intergrading toward Gray-Brown Podzolic soils.
Dekalb	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sol Bruns Acides.
Ernest	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols	Red-Yellow Podzolic soils intergrading toward Gray-Brown Podzolic soils.
Gilpin	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils intergrading toward Gray-Brown Podzolic soils.
Landes [3]	Coarse-loamy, mixed, mesic	Fluventic Hapludolls	Mollisols	Alluvial soils.
Lickdale	Fine-loamy, mixed, acid, mesic	Humic Haplaquepts	Inceptisols	Humic-Gley soils.
Meckesville	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils intergrading toward Gray-Brown Podzolic soils.
Monongahela	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soil intergrading toward Gray-Brown Podzolic soils.
Muskingum	Fine-loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides intergrading toward Lithosols.
Philo	Coarse-loamy, mixed, mesic	Fluvaquentic Dystrochrepts	Inceptisols	Alluvial soils.
Pope	Coarse-loamy, mixed, mesic	Fluventic Dystrochrepts	Inceptisols	Alluvial soils.
Rayne	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Shelocta	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Summers	Loamy-skeletal, mixed, mesic	Typic Haplumbrepts	Inceptisols	Sols Bruns Acides.
Wharton	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils.

[1] Based on July 1969, placement.
[2] Taxadjunct; the depth to stratified material is less than currently defined for the Chavies series, but this difference does not alter the usefulness or behavior of the soil.
[3] Taxadjunct; the Landes soil lacks the free carbonates in the lower part of the subsoil that is characteristic of the series as now defined, but this difference does not alter the usefulness or behavior of the soil.

clay accumulation. They do, however, exhibit some degree of development, including weak structure and changes resulting in a B horizon that has slightly brighter or stronger colors than those of the surface layer and substratum. The Dekalb soils are examples of Inceptisols.

Mollisols have a thick, dark-colored surface layer called the mollic epipedon. Their name is derived from the Latin *mollis*, for soft. They may or may not have a horizon of clay accumulation. Landes soils, formerly classified as Alluvial soils, are in this order. They do not have a B horizon of clay accumulation, and because they formed in recent alluvium, organic matter occurs erratically through the subsurface layers.

Alfisols are soils that have a B horizon of clay accumulation. Their B horizon has bright colors, moderate to strong structure, and relatively high base saturation. This order includes Ashton soils.

Ultisols also have a B horizon of clay accumulation. This horizon has bright colors, moderate to strong structure, and relatively low base saturation. It includes soils formerly classified as Red-Yellow Podzolic soils. Monongahela and Ernest soils are in this order.

SUBORDER.—Each order is divided into suborders, primarily on the basis of those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging or soil differences that result from climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is Udults (*Ud* meaning humid, and *ult* from Ultisols).

GREAT GROUP.—Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus has accumulated or those that have pans that interfere with the growth of roots or movement of water. The features used are the properties of clays, soil temperature, major differences in chemical composition

(mainly calcium, magnesium, sodium, and potassium), and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Fragiudult (*Fragi* meaning fragipan; *ud* for humid; and *ult* from Ultisols).

SUBGROUP.—Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, that have properties of the group and also have one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Fragiudult (a typical Fragiudult).

FAMILY.—Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and the like that are used as family differentia (see table 11). An example is the fine-loamy, mixed, mesic family of Typic Fragiudults.

Some readers will want to know how the soils would have been classified under the 1938 soil classification system. Table 11 also shows the soils classified in great soil groups according to the 1938 system (*3*), as modified in 1949 (*13*).

General Nature of the Area

The first settlements were made in the survey area by hunters and trappers in about 1790. These men came mostly from Virginia and were of English descent. Fayette County was organized in 1831. Raleigh County, with Beckley as the county seat, was formed from a part of Fayette County in 1850. Coal mining and lumbering developed after the Chesapeake and Ohio Railroad was constructed in about 1873. These have become large and important industries. The two counties produced 13.7 million tons of coal in 1969, or about 10 percent of the total State output for that year. Lumbering has continued as a large industry, and four-fifths of the survey area is wooded.

Population increased rapidly after coal mining began. In 1970 the population was 114,390. Beckley, the largest city in the area, had a population of 19,884. Fayetteville, the county seat of Fayette County, had a population of 1,712, and Montgomery, on the New River, had a population of 1,786. Many small mining and trade-center towns are in the two counties.

Farming is relatively unimportant in the survey area. In 1964, only 13.5 percent of the area was in farms. Most farms are of the general type.

The area has a network of improved roads that includes some major highways. Among the major railroads are the Chesapeake and Ohio, Norfolk and Western, and Penn-Central. Many feeder lines have been extended through the survey area to transport coal to market.

Physiography, Relief, and Drainage

The two-county area lies within the Allegheny Plateau region. The elevations range from 3,566 feet on Huff Knob in Raleigh County to 613 feet where the Kanawha River leaves the western part of Fayette County. Generally, the area is rough and mountainous. It is an old plateau region, and some rather broad flats at elevations of 2,000 to 2,500 feet remain in the eastern three-fifths of the survey area. The valleys are narrow and have very steep sides. The deepest geologic erosion is along the New River. This is a narrow, gorgelike valley, about 1,300 to 1,700 feet deep and about a mile wide. The Chesapeake and Ohio Railroad traverses this gorge. The western two-fifths of the survey area is thoroughly dissected by narrow ridges and valleys. Streams are generally nearly 1,000 feet below the ridges. The area is drained by the New River and the Kanawha River in the northeast and by tributaries of the Coal and Guyandot Rivers in the west.

Climate[5]

The humid, continental type of climate of the two counties is characterized by sharp temperature contrasts, both seasonal and, frequently, day to day. Because of predominant westerly circulation of the atmosphere in this latitude, considerable moisture is deposited on the windward slopes of the higher ridges, and thus there is a gradual statewide increase in annual precipitation from west to east. Recorded totals have averaged between 45 and 46 inches at climate stations in this area, and statewide analyses suggest that annual precipitation (liquid) averages more than 50 inches on the highest ridges in the eastern part of Fayette County. Snowfall shows the same pattern, but in a more marked degree. Average seasonal snowfall totals nearly 30 inches along the western borders of both counties, increasing to more than 40 inches over most of the area. The highest ridges in the eastern part of Fayette County average more than 60 inches.

Temperature and precipitation data based on records of the Beckley Veterans Administration Hospital, Raleigh County, are given in tables 12 and 13.

Winter climate is mild at elevations of less than 1,500 feet; moderately rigorous at elevations between 1,500 and 3,000 feet; and frequently severe at the higher elevations of more than 3,000 feet. Although cold waves occur two or three times per year on the average, they seldom last longer than a few days. Below-zero temperatures, as well as temperatures in the seventies, have been recorded in December, January, and February. A minimum of −13° F. can be expected once every 10 years and −16°, once every 25 years on the average. Snowstorms are usually followed by thawing periods, and there is no large-scale melting in spring of a seasonally accumulated snowpack. Total snowfall amounts vary greatly from winter to winter. South-facing hillsides rapidly lose

[5] By ROBERT O. WEEDFALL, State climatologist, National Weather Service, U.S. Department of Commerce.

TABLE 12.—*Temperature and precipitation data*

[Temperature and precipitation data from the Beckley Veterans Administration Hospital, Raleigh County (elevation 2,330 feet). Minor allowances will have to be made when applying the data to other locations at different elevations, as noted in the text. All data are for a 30-year period except snowfall data, which are for a 19-year period]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have about 4 days with— Maximum temperature equal to or higher than—	Two years in 10 will have about 4 days with— Minimum temperature equal to or lower than—	Average total	One year in 10 will have— Less than—	One year in 10 will have— More than—	Average number of days with snow cover of 1 inch or more	Average depth of snow on days with snow cover
	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Number	Inches
January	44	23	60	2	3. 64	1. 6	6. 1	10	3. 9
February	46	24	61	5	3. 47	2. 0	5. 6	8	4. 6
March	52	28	68	12	4. 47	2. 7	7. 3	5	5. 3
April	65	37	79	22	3. 62	1. 8	5. 2	1	1. 8
May	74	47	84	33	4. 01	2. 0	6. 4		
June	79	54	87	42	4. 46	2. 4	7. 1		
July	82	58	88	48	5. 15	3. 0	8. 2		
August	81	57	88	45	4. 53	2. 5	7. 2		
September	77	50	87	35	3. 28	1. 5	6. 2		
October	67	39	78	24	2. 61	. 9	4. 9	([3])	2. 5
November	54	30	69	14	2. 68	1. 5	4. 6	2	3. 4
December	45	24	61	5	3. 19	1. 7	5. 3	7	3. 4
Year	64	39	[1] 92	[2] −5	45. 11	37. 5	54. 5	33	4. 1

[1] Average annual highest temperature.
[2] Average annual lowest temperature.
[3] Less than ½ day.

their snow cover in the frequent lulls between storms when solar radiation becomes effective.

Summer temperatures are not extreme and are generally comfortable on the plateau areas of more than 1,500 feet elevation. Cool nights are induced by the elevation throughout the summer. Temperatures of more than 100° occur only infrequently at elevations of less than 1,500 feet. Temperatures of 90° or more are unusual on the plateau areas of more than 1,500 feet. Beckley averages 6 days per year with temperatures of 90° or more. Maximum temperatures at elevations of less than 1,500 feet average about 5° higher than on the plateau areas represented by Beckley's data. Thunderstorms occur on an average of 40 to 50 days per year, are more frequent over the higher elevations, and have their most frequent occurrences in June and July. Flash floods on smaller watersheds are not infrequent and result from heavy rainfall from large-area storms or intense thunderstorms. Tornadoes and hailstorms are rare. The length of the growing season is usually adequate for crops common to the region. The freeze-free season averages 141 days in the Beckley area. Evaporation from ponds and reservoirs is about 19 inches from May through October and 27 inches annually. Light winds

TABLE 13.—*Probability of last freezing temperature in spring and first in fall* (5)

[Data from a 30-year record at the Beckley Veterans Administration Hospital, Raleigh County (elevation 2,330 feet). Elevation differences of 1,000 feet would change the dates by about 7 days (earlier in spring and later in fall for lower elevations, etc.)]

Probability	Dates for given probability and temperature		
	16° F. or lower	24° F. or lower	32° F. or lower
Spring:			
1 year in 10 later than	April 9	April 29	May 31
1 year in 4 later than	March 30	April 22	May 20
5 years in 10 later than	March 19	April 15	May 11
Fall:			
1 year in 10 earlier than	October 23	October 6	September 15
1 year in 4 earlier than	November 4	October 14	September 22
5 years in 10 earlier than	November 17	October 23	September 29

prevail in the lulls between storms and occur most frequently late in summer and in fall, especially in valley locations. Valley fogs are most common late in summer and in fall because of more abundant moisture. Nighttime and early-morning relative humidity averages are quite high, 80 to 95 percent, but midday values are more moderate, about 50 to 60 percent for all months. Periods of oppressive humidity and warm temperatures are more frequent at elevations of less than 1,000 feet.

Water Supply

The two-county area is well supplied with surface streams and many small springs. Innumerable small streams supply local needs, and the New River flows across this area from the east and empties into the Kanawha River, which leaves Fayette County at Montgomery. This river is dammed near Hawk's Nest and is used for electric power. Paint Creek and Clear Fork are the larger streams in the western part of the survey area. Many small- to medium-sized ponds and lakes have been constructed on small streams on the gentle plateau flats. Locally, much water comes from wells. The quality of this water varies from place to place, depending on the proximity to coal seams.

Farming

The statistics in this section are based mostly on reports of the 1964 U.S. Census of Agriculture.

Farming is relatively unimportant to the economy of Fayette and Raleigh Counties. Of the 808,320 acres in the survey area, only 109,719 acres, or 13.5 percent, was in farms. Fayette County had 644 farms that had a total of 48,536 acres, and Raleigh County had 736 farms that had a total of 61,183 acres. Farms in the two-county area average about 79.5 acres each.

Land use in the survey area has been stable, although the last decade has seen a marked trend in steeper pasture land reverting to idle land and brushy woods. The demand for urban housing and industrial building has increased slightly. In 1964 land use was reported as follows:

	Acres	
	Fayette County	*Raleigh County*
Cropland:		
Harvested	6,952	8,129
Used for pasture	5,982	6,641
Not harvested and not pastured	2,499	3,681
Woodland:		
Pastured	7,044	9,443
Not pastured	15,538	20,510
Other pasture (not cropland and not woodland)	9,075	10,760

In 1964, only corn and oats had a total of more than 100 acres in the survey area. Corn for all purposes was grown on 510 acres in Fayette County and on 519 acres in Raleigh County. Oats grew on 170 acres in Fayette County and on 71 acres in Raleigh County. Hay consisting of alfalfa and alfalfa mixtures grew on 1,038 acres in Fayette County and on 1,172 acres in Raleigh County. Fayette County had 4,309 acres of hay consisting of clover, timothy, and mixtures, and Raleigh County had 4,876 acres.

Also in 1964, there were 4,457 cattle and calves in Fayette County and 5,223 in Raleigh County. Fayette County had 815 milk cows, and Raleigh County had 1,125 milk cows. Hogs and pigs totaled 937 head in Fayette County and 1,145 head in Raleigh County. Sheep and lambs amounted to 762 in Fayette County and 830 in Raleigh County.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in

the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms are called peds. Clods are aggregates produced by tillage or logging.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil that has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Bedrock. The solid rock that underlies soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperate areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Catena. A sequence, or "chain," of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand; and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

First bottom. The normal flood plain of a stream subject to frequent or occasional flooding.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the lower horizons, as a result of waterlogging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Gravelly soil material, 15 to 50 percent of material, by volume, consisting of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.

Leached layer. A layer from which the soluble materials have been dissolved and washed away by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

Loam. Soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Loess. Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

Miscellaneous land type. A mapping unit for areas of land that have little or no natural soil; or that are too nearly inaccessible for orderly examination; or that occur where, for other reasons, it is not feasible to classify the soil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Sedimentary rock. A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate, from gravel; sandstone, from sand; shale, from clay; and limestone, from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sands have been consolidated into sandstone.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 milimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Trace elements. The chemical elements found in soils in extremely small amounts, yet which are essential to plant growth. Some of the trace elements are zinc, cobalt, manganese, copper, and iron.

Upland (geological). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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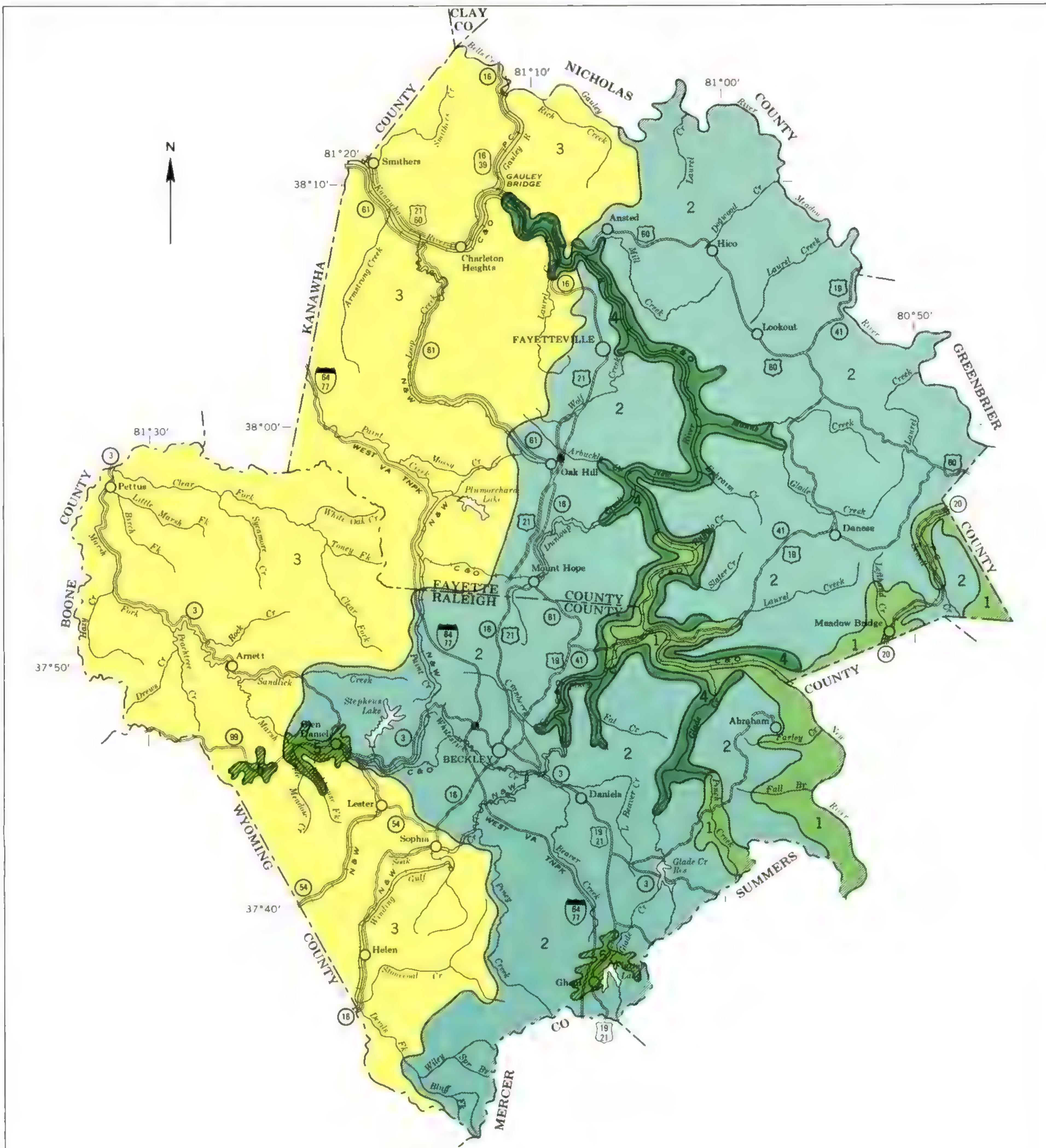


SOIL ASSOCIATIONS *

1 — Calvin-Gilpin association: Moderately deep, well-drained, medium-textured, mostly sloping to very steep soils on dissected uplands and mountains

2 — Dekalb-Gilpin-Ernest association: Moderately deep, well-drained, moderately coarse textured and medium-textured, mostly sloping to very steep soils on dissected uplands and deep, moderately well drained, mostly sloping or steep soils on foot slopes

3 — Muskingum-Shelocta association: Moderately deep, well-drained, medium-textured, mostly very steep soils on strongly dissected uplands and deep, well-drained, sloping to steep soils on foot slopes

4 — Steep rock land-Dekalb-Gilpin association: Rough broken sandstone cliffs and rock outcrop areas on uplands and moderately deep, well-drained, moderately coarse textured and medium-textured, very steep soils on uplands

5 — Atkins-Lickdale-Brinkerton association: Deep, poorly drained, medium-textured, nearly level soils on flood plains and deep, poorly drained and very poorly drained, nearly level to gently sloping soils on foot slopes

* Texture terms refer to texture of the surface layer.

Compiled 1973

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION

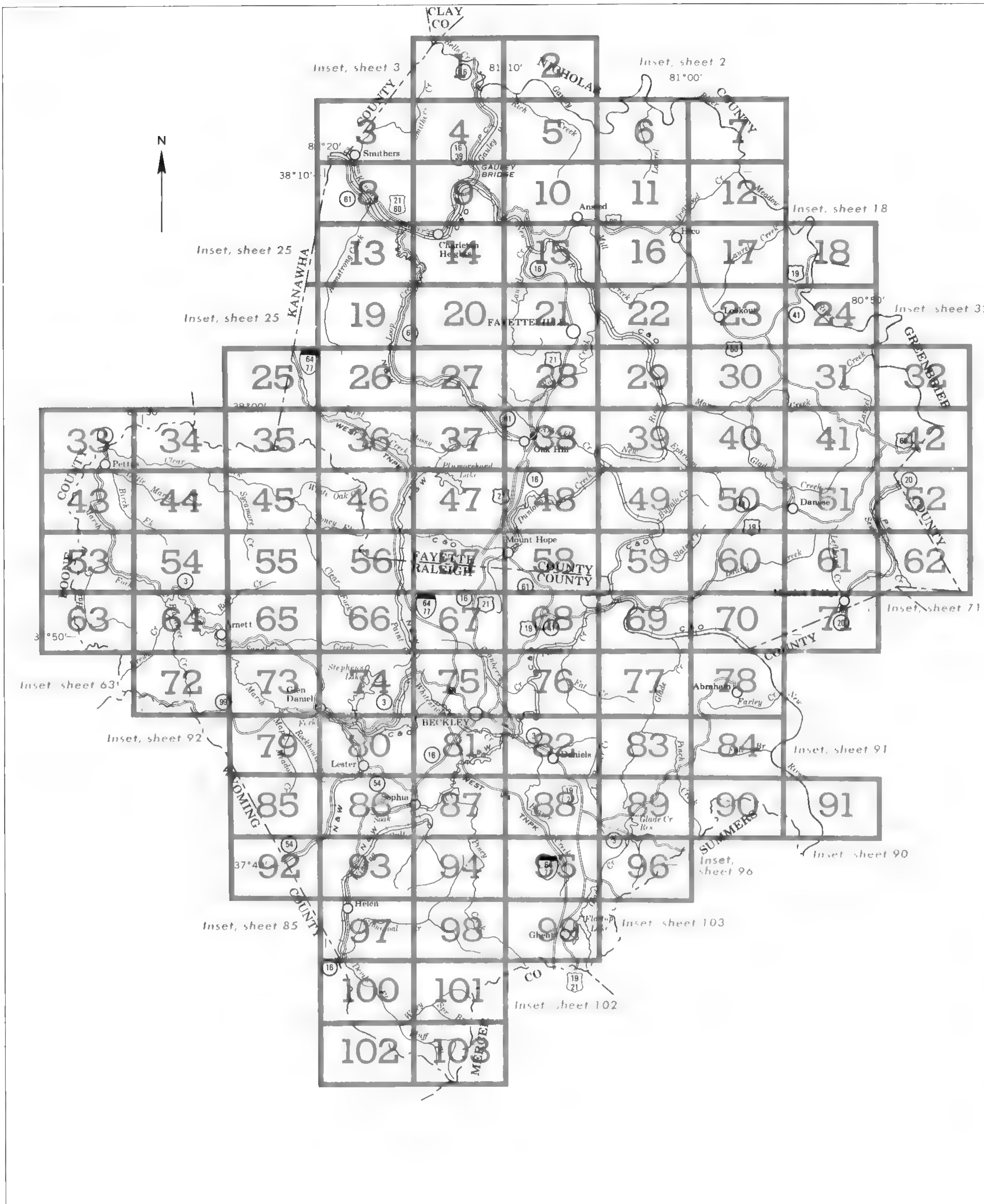
GENERAL SOIL MAP

FAYETTE AND RALEIGH COUNTIES WEST VIRGINIA

Scale 1:316,800

1 0 1 2 3 4 5 Miles

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS
FAYETTE AND RALEIGH COUNTIES
WEST VIRGINIA

Scale 1:316,800

SOIL LEGEND

[illegible] pe letter are [illegible] considerable range of [illegible] s named as severely eroded.

SYMBOL	NAME
[illegible]	Alluvial land
A[illegible]	Ashton fine sandy [illegible]
A[illegible]	Atkins silt loam
[illegible]	[illegible]
[illegible]	[illegible] 0 to [illegible] percent slopes
[illegible]	[illegible]-Gilpin silt [illegible] percent slopes
[illegible]	[illegible] percent slopes, severely eroded
[illegible]	[illegible] percent slopes
[illegible]	[illegible] silt loams, 30 to 40 percent slopes, [illegible]
[illegible]	[illegible] silt loams, [illegible] to 70 percent slopes
[illegible]	[illegible] silt loams, 40 to 70 percent slopes, severely eroded
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible]
[illegible]	[illegible] fine sandy loam
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible]
[illegible]	[illegible] fine sandy loam, [illegible] percent slopes
[illegible]	[illegible]
[illegible]	Dekalb channery loam, 20 to [illegible] percent slopes
[illegible]	Dekalb channery loam, [illegible] percent slopes
[illegible]	Dekalb [illegible]
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible] 10 percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible] percent slopes
[illegible]	Gilpin silt loam, [illegible] percent slopes
[illegible]	[illegible] percent slopes, severely eroded
[illegible]	[illegible]
[illegible]	Gilpin silt loam, 20 to 30 percent slopes, severely eroded
[illegible]	Gilpin silt loam, 30 to 40 percent slopes
[illegible]	Gilpin silt loam, 30 to 40 percent slopes, severely eroded
[illegible]	Gilpin silt loam, 40 to 65 percent slopes
[illegible]	[illegible] percent slopes, severely eroded
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible] loam
[illegible]	Made land
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible] silt loam, 10 to 20 percent slopes
[illegible]	[illegible] stony silt loam, 20 to 40 percent slopes
[illegible]	[illegible]
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible] 10 to [illegible] percent slopes, severely eroded
[illegible]	[illegible] loam, 20 to 30 percent slopes
[illegible]	[illegible] loam, 20 [illegible] percent slopes, severely eroded
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes, severely eroded
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible]
P[illegible]	P[illegible]
P[illegible]	P[illegible]
[illegible]	Rayne [illegible] percent slopes
[illegible]	Rayne silt loam, [illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible] percent slopes
[illegible]	[illegible] loam, 30 to 40 percent slopes
[illegible]	Steep rock land
[illegible]	[illegible]
[illegible]	Summers loam, 3 to 10 percent slopes
[illegible]	Wharton [illegible] loam, 3 to 10 percent slopes
[illegible]	Wharton silt loam, 10 to 20 percent slopes
[illegible]	Wharton [illegible] percent slopes, severely eroded

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
Divided
[illegible]
Bridges and crossings
[illegible]
Ford
Grade
Power line
Pipe line
Cemetery
Dams
Levee
Tanks
Well, oil or gas
Windmill
Located object

BOUNDARIES

National or state
County
Minor civil division
Reservation
Land grant
[illegible]

DRAINAGE

[illegible]
Drainage end or alluvial fan

RELIEF

[illegible]

SOIL SURVEY DATA

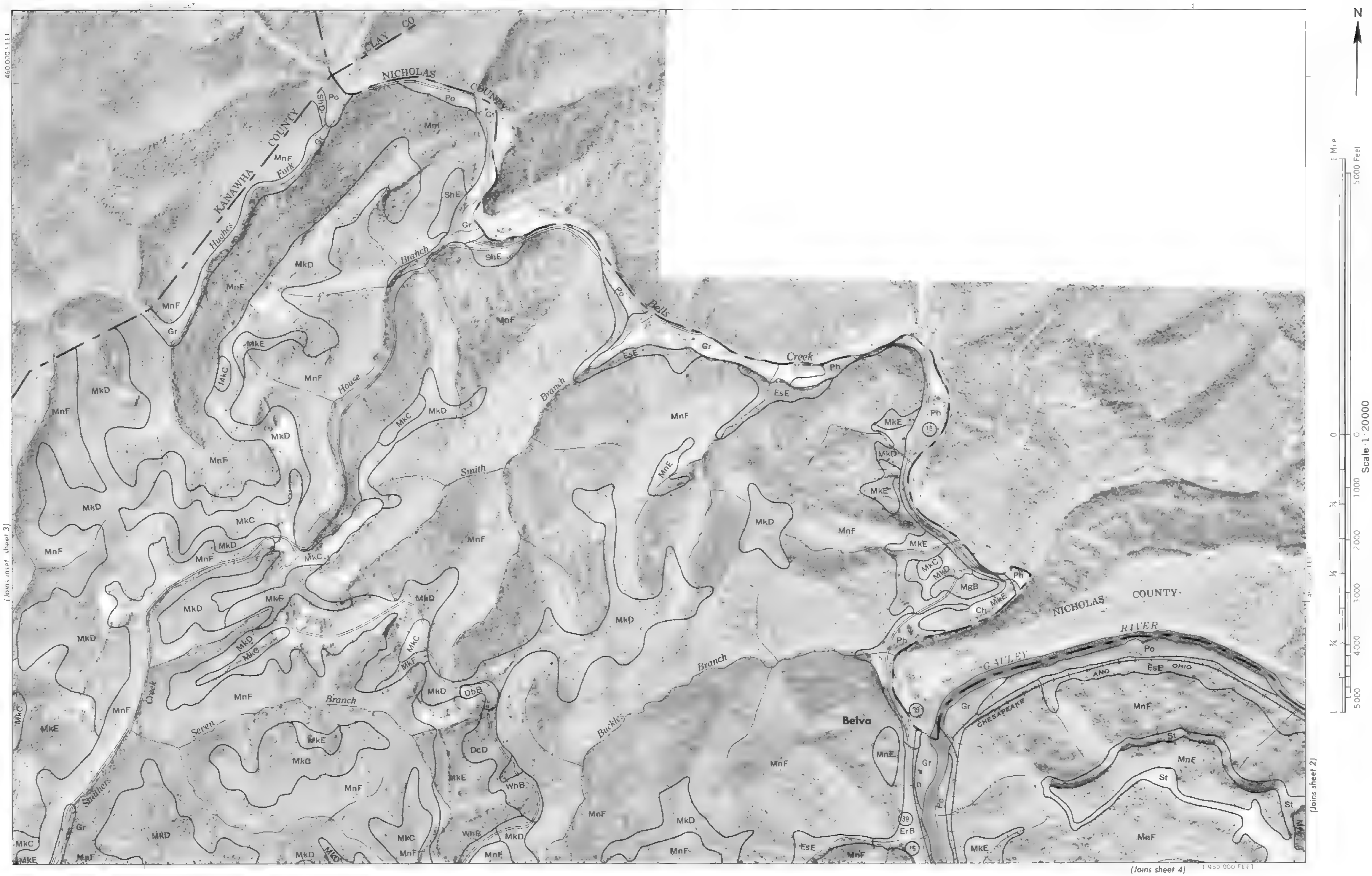
[illegible]
Dx
Rock outcrop
Chert fragments
Clay spot
Sand spot
[illegible]
Made land
[illegible]
Strip mine, narrow

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Management for agricultural use is discussed in the mapping unit. However, a brief description of the capability units is given. Dashes indicate that the mapping unit was not assigned to a capability unit. Other information is given as follows:

Acreage and extent, table 1, page 6.
Estimated yields, table 2, page 30.
Woodland, tables 3 and 4, pages 32 and 40, respectively.
Wildlife, table 5, page 42.
Engineering uses of soils, tables 6, 7, and 8, pages 48 through 57.
Town and country planning, table 9, page 60.

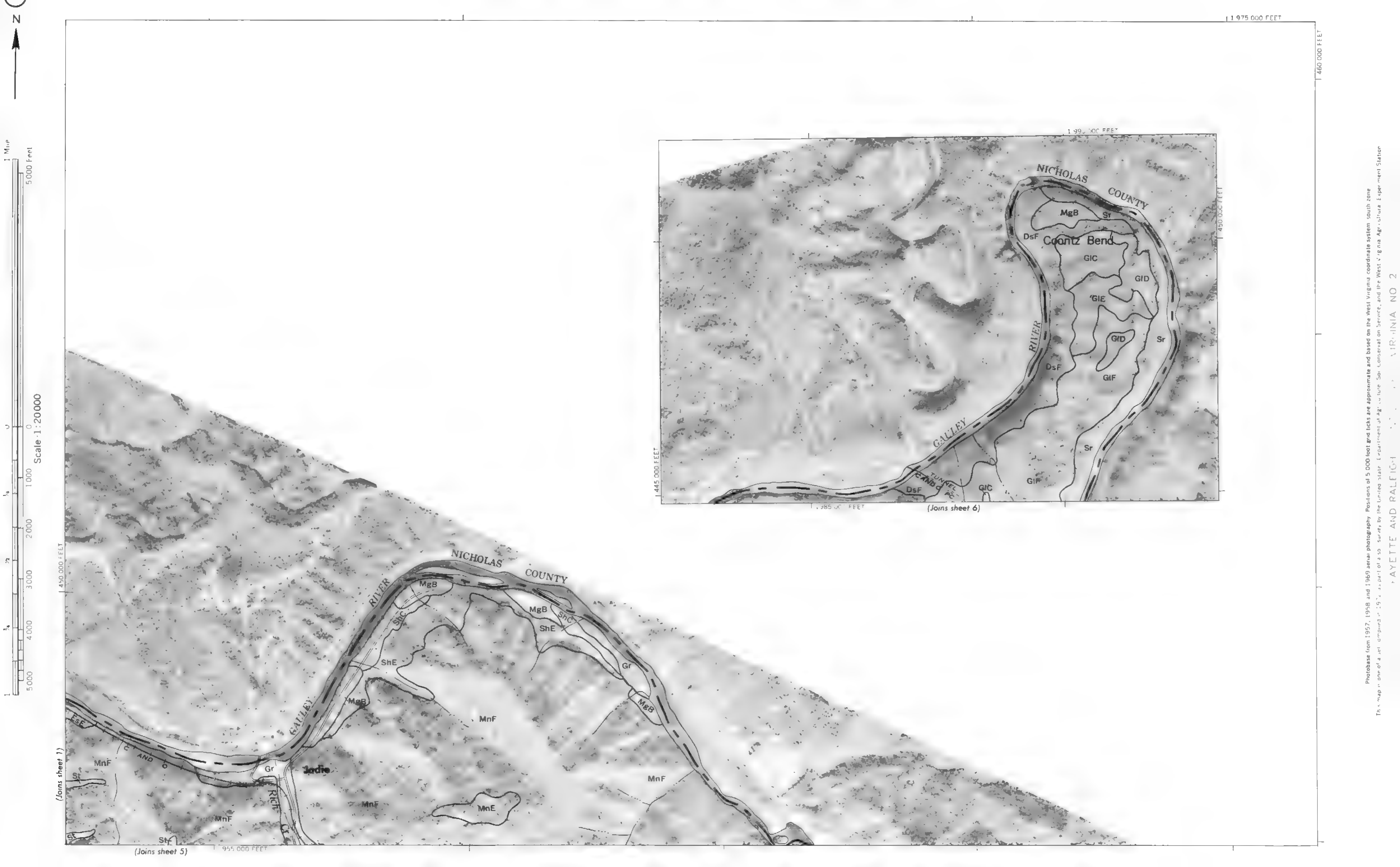
Map symbol	Mapping unit	Described on page	Capability unit	
			Symbol	Page
Ad	Alluvial land	7	VIw-1	29
As	Ashton fine sandy loam	8	I-6	28
At	Atkins silt loam	8	IIIw-1	28
Br	Brinkerton silt loam	9	IVw-5	29
CaC	Calvin-Gilpin silt loams, 10 to 20 percent slopes	10	IIIe-10	28
CaD	Calvin-Gilpin silt loams, 20 to 30 percent slopes	10	IVe-3	28
CaD3	Calvin-Gilpin silt loams, 20 to 30 percent slopes, severely eroded	10	VIe-2	29
CaE	Calvin-Gilpin silt loams, 30 to 40 percent slopes	10	VIe-2	29
CaE3	Calvin-Gilpin silt loams, 30 to 40 percent slopes, severely eroded	10	VIIe-2	29
CaF	Calvin-Gilpin silt loams, 40 to 70 percent slopes	11	VIIe-2	29
CaF3	Calvin-Gilpin silt loams, 40 to 70 percent slopes, severely eroded	11	VIIe-2	29
CgC	Calvin-Gilpin very stony silt loams, 10 to 20 percent slopes	11	VIs-2	29
CgE	Calvin-Gilpin very stony silt loams, 20 to 40 percent slopes	11	VIIs-2	29
CgF	Calvin-Gilpin very stony silt loams, 40 to 70 percent slopes	11	VIIs-2	29
Ch	Chavies fine sandy loam	12	I-6	28
ClB	Clymer loam, 3 to 10 percent slopes	12	IIe-4	28
ClC	Clymer loam, 10 to 20 percent slopes	12	IIIe-4	28
CpB	Cookport loam, 2 to 8 percent slopes	13	IIe-13	28
DbB	Dekalb fine sandy loam, 3 to 10 percent slopes	14	IIe-12	28
DbC	Dekalb fine sandy loam, 10 to 20 percent slopes	14	IIIe-12	28
DcD	Dekalb channery loam, 20 to 30 percent slopes	14	IVe-5	28
DcE	Dekalb channery loam, 30 to 40 percent slopes	14	VIe-2	29
DsC	Dekalb and Gilpin very stony soils, 5 to 20 percent slopes	14	VIIs-2	29
DsE	Dekalb and Gilpin very stony soils, 20 to 40 percent slopes	14	VIIs-2	29
DsF	Dekalb and Gilpin very stony soils, 40 to 70 percent slopes	14	VIIs-2	29
ErB	Ernest silt loam, 3 to 10 percent slopes	15	IIe-13	28
ErC	Ernest silt loam, 10 to 20 percent slopes	15	IIIe-13	28
EsC	Ernest and Shelocta very stony silt loams, 5 to 20 percent slopes	15	VIs-2	29
EsE	Ernest and Shelocta very stony silt loams, 20 to 40 percent slopes	15	VIIs-2	29
GlB	Gilpin silt loam, 3 to 10 percent slopes	16	IIe-10	28
GlC	Gilpin silt loam, 10 to 20 percent slopes	16	IIIe-10	28
GlC3	Gilpin silt loam, 10 to 20 percent slopes, severely eroded	16	IVe-3	28
GlD	Gilpin silt loam, 20 to 30 percent slopes	16	IVe-3	28
GlD3	Gilpin silt loam, 20 to 30 percent slopes, severely eroded	16	VIe-2	29
GlE	Gilpin silt loam, 30 to 40 percent slopes	17	VIe-2	29
GlE3	Gilpin silt loam, 30 to 40 percent slopes, severely eroded	17	VIIe-2	29
GlF	Gilpin silt loam, 40 to 65 percent slopes	17	VIIe-2	29
GlF3	Gilpin silt loam, 40 to 65 percent slopes, severely eroded	17	VIIe-2	29
Gr	Gravelly alluvial land	18	IIIs-6	28
La	Landes fine sandy loam	18	IIw-6	28
Lc	Lickdale silt loam	19	IVw-1	28
Ma	Made land	19	------	--
McE	Meckesville silt loam, 3 to 10 percent slopes	20	IIe-4	28
McC	Meckesville silt loam, 10 to 20 percent slopes	20	IIIe-4	28
MdC	Meckesville very stony silt loam, 10 to 20 percent slopes	20	VIs-2	29
MdE	Meckesville very stony silt loam, 20 to 40 percent slopes	20	VIIs-2	29
Me	Mine dump	20	------	--
MgA	Monongahela silt loam, 0 to 3 percent slopes	21	IIw-1	28
MgB	Monongahela silt loam, 3 to 10 percent slopes	21	IIe-13	28
MkC	Muskingum silt loam, 10 to 20 percent slopes	21	IIIe-10	28
MkC3	Muskingum silt loam, 10 to 20 percent slopes, severely eroded	21	IVe-3	28
MkD	Muskingum silt loam, 20 to 30 percent slopes	22	IVe-3	28
MkD3	Muskingum silt loam, 20 to 30 percent slopes, severely eroded	22	VIe-2	29
MkE	Muskingum silt loam, 30 to 40 percent slopes	22	VIe-2	29
MkE3	Muskingum silt loam, 30 to 40 percent slopes, severely eroded	22	VIIe-2	29
MkF	Muskingum silt loam, 40 to 75 percent slopes	22	VIIe-2	29
MnE	Muskingum very stony silt loam, 20 to 40 percent slopes	22	VIIs-2	29
MnF	Muskingum very stony silt loam, 40 to 75 percent slopes	22	VIIs-2	29
Ph	Philo silt loam	23	IIw-7	28
Po	Pope fine sandy loam	24	IIw-6	28
RaB	Rayne silt loam, 3 to 10 percent slopes	24	IIe-4	28
RaC	Rayne silt loam, 10 to 20 percent slopes	24	IIIe-4	28
ShC	Shelocta silt loam, 10 to 20 percent slopes	25	IIIe-4	28
ShD	Shelocta silt loam, 20 to 30 percent slopes	25	IVe-3	28
ShE	Shelocta silt loam, 30 to 40 percent slopes	25	VIe-2	29
Sr	Steep rock land	25	VIIIs-1	29
St	Strip mine spoil	25	------	--
SuB	Summers loam, 3 to 10 percent slopes	26	IIe-12	28
WhB	Wharton silt loam, 3 to 10 percent slopes	27	IIe-13	28
WhC	Wharton silt loam, 10 to 20 percent slopes	27	IIIe-13	28
WhC3	Wharton silt loam, 10 to 20 percent slopes, severely eroded	27	IVe-9	28

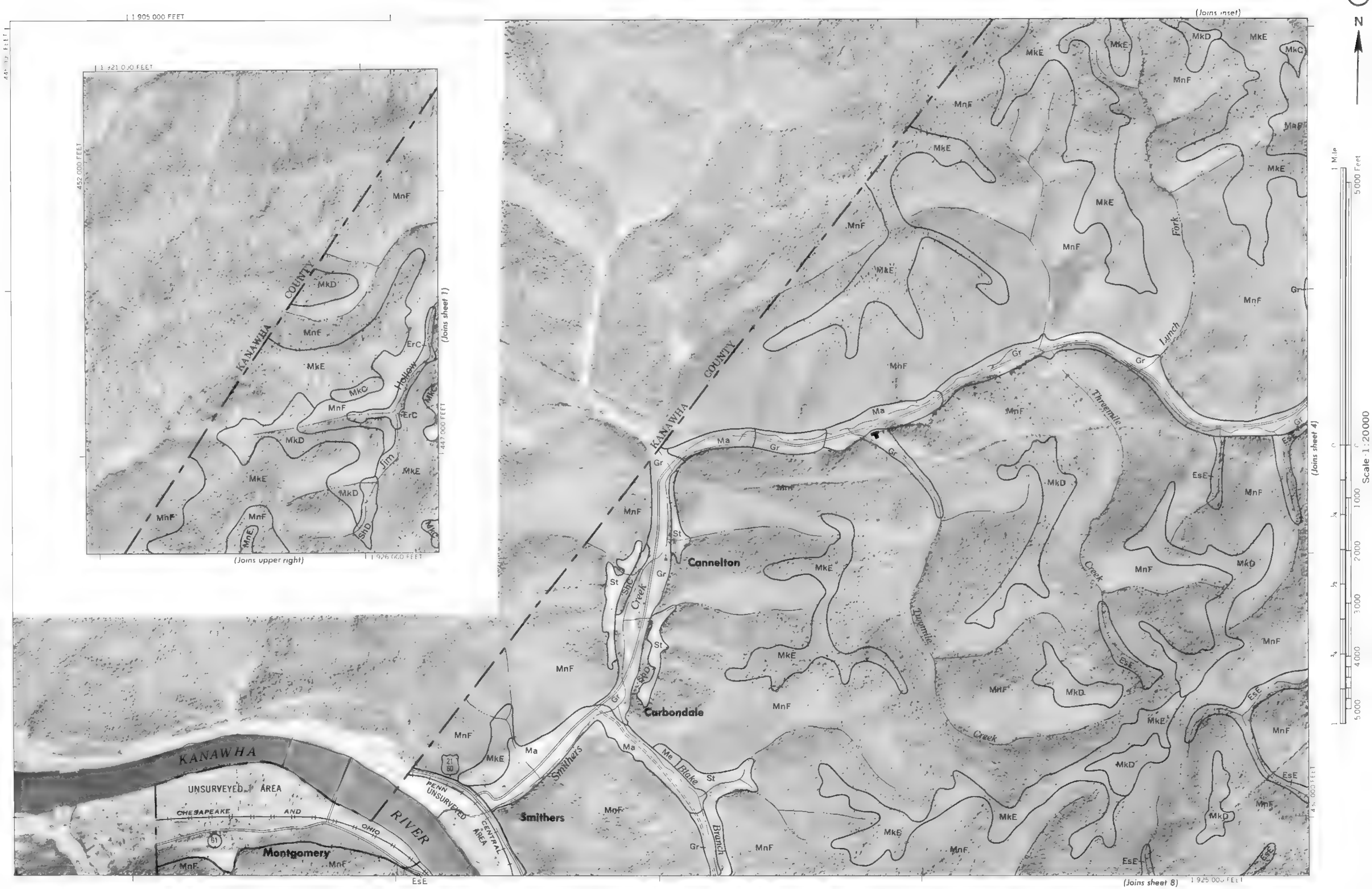


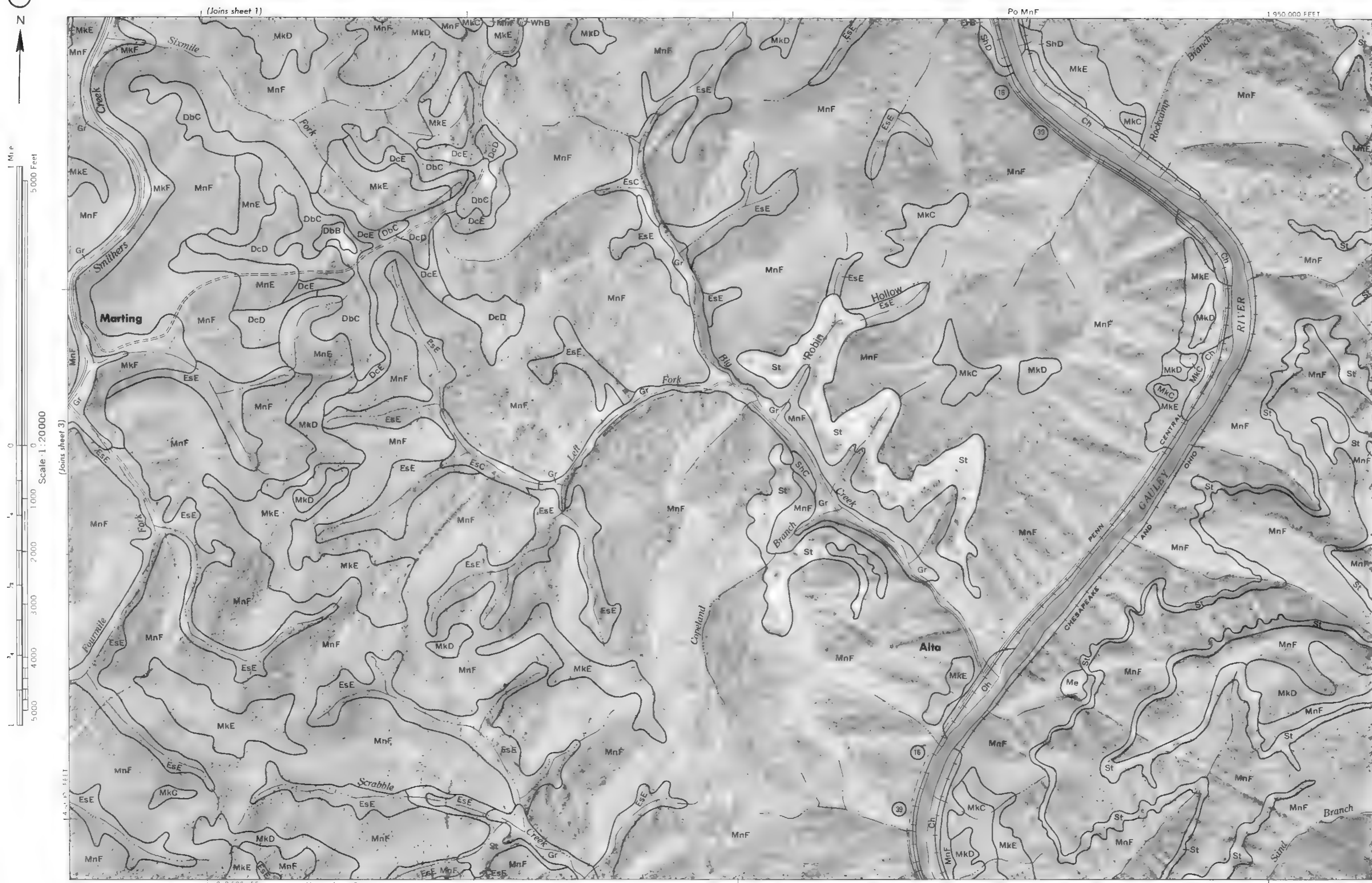
FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 1

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from [illegible] aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the West Virginia coordinate system [illegible]

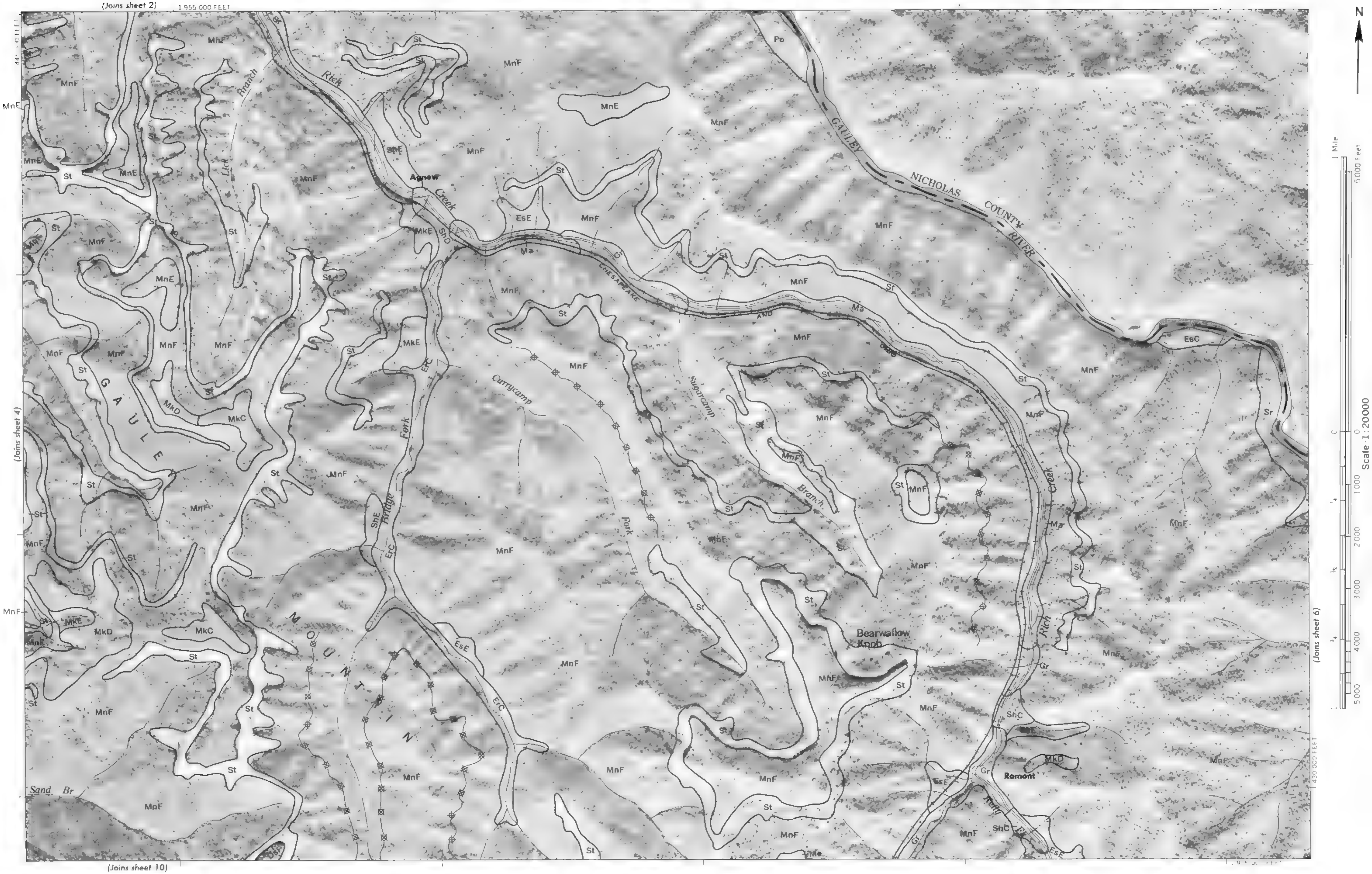

2
N
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
1 975 000 FEET
460 000 FEET
450 000 FEET
955 000 FEET
(Joins sheet 1)
(Joins sheet 5)
(Joins sheet 6)
445 000 FEET
NICHOLAS COUNTY
GAULEY RIVER
Coontz Bend
Jodie
MgB
Sr
DsF
GlC
GlD
GlE
GlF
ShC
ShE
Gr
MnF
MnE
EsE
St
C AND O
TUNNEL
FAYETTE AND RALEIGH


3
N
1 905 000 FEET
1 921 000 FEET
452 000 FEET
447 000 FEET
(Joins sheet 1)
(Joins upper right)
1 926 000 FEET
KANAWHA COUNTY
MnF
MkD
MkE
MkC
ErC
Hollow
Jim
ShD
MnE
(Joins inset)
Lunch
Fork
Threemile
Creek
Twomile
Gr
Ma
Me
St
EsE
MaF
Cannelton
Carbondale
Smithers
Montgomery
Shc
Blake
Branch
KANAWHA
RIVER
UNSURVEYED AREA
CHESAPEAKE AND OHIO
PENN CENTRAL
UNSURVEYED AREA
21
60
61
(Joins sheet 4)
(Joins sheet 8)
1 925 000 FEET
1 Mile
5000 Feet
Scale 1:20000



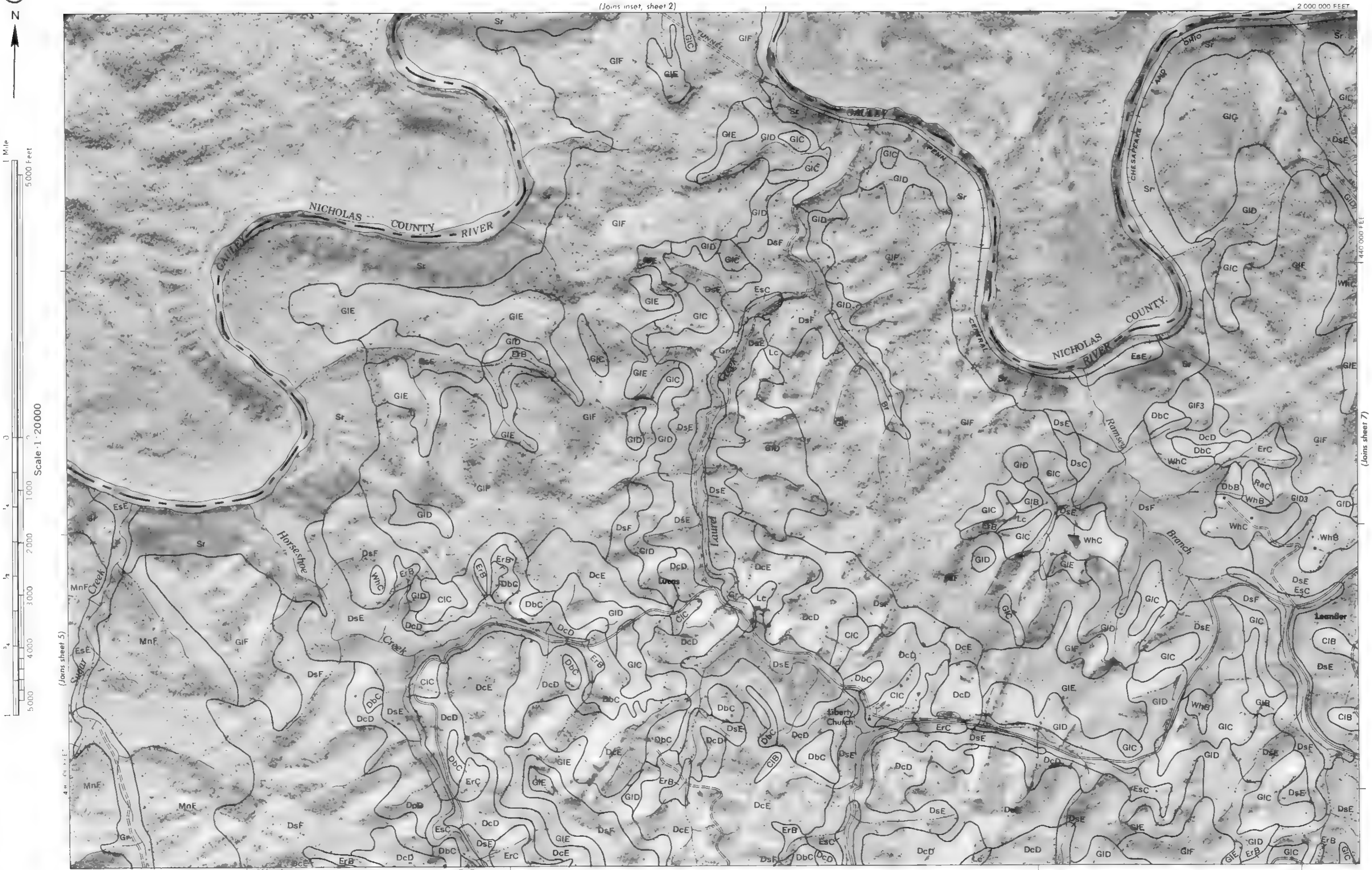
Photobase from 1958 and 1969 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the West Virginia coordinate system south zone.

This map is one of a set compiled in 197_ as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.



Photobase from 1957, 1958 and 1959 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

6

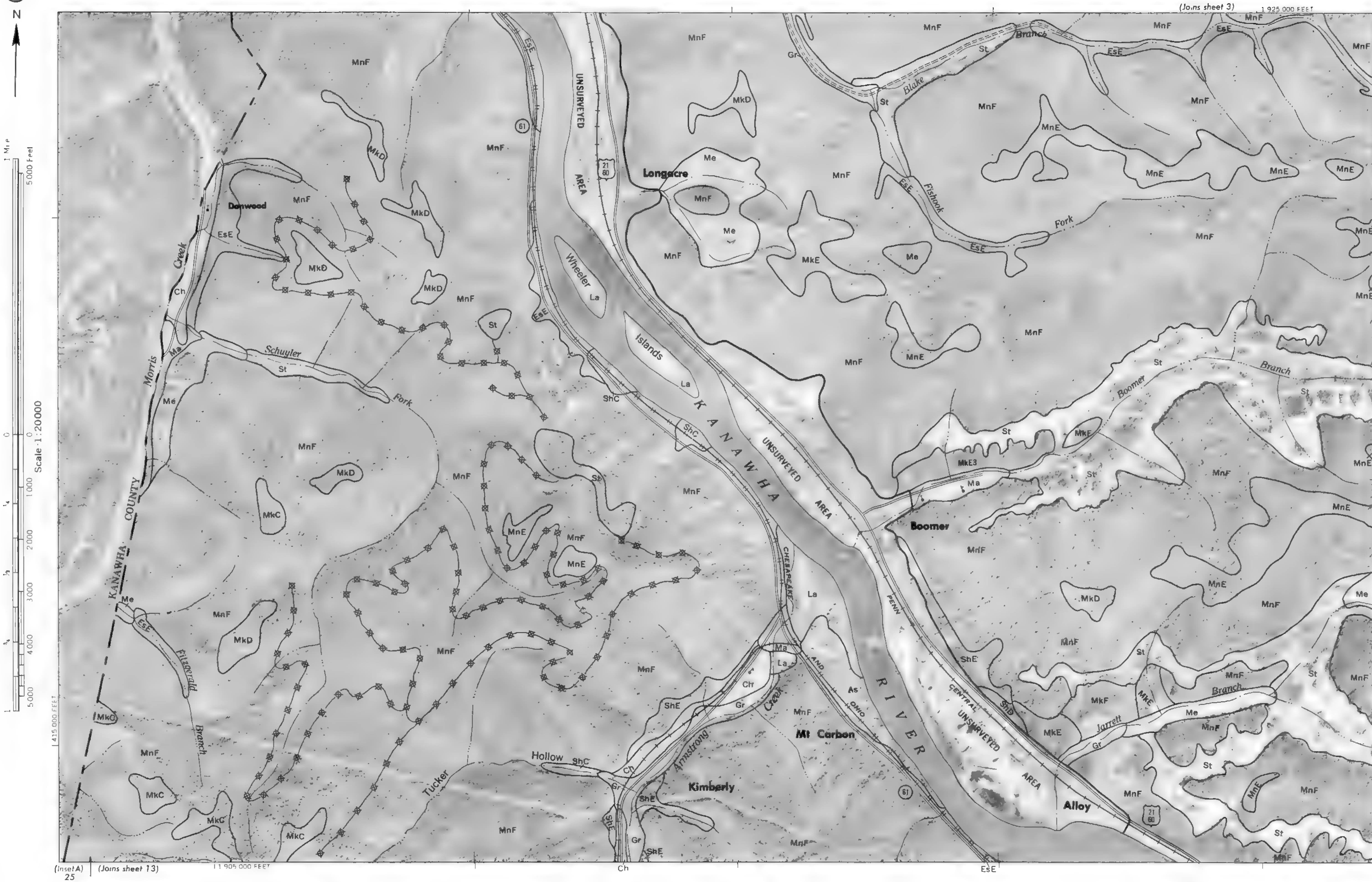


Photobase from 1957, 1958 and 1959 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States … Soil Conservation Service and the West Virginia Agricultural Experiment Station.

FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 7

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958, and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.



Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the West Virginia Agricultural Experiment Station.

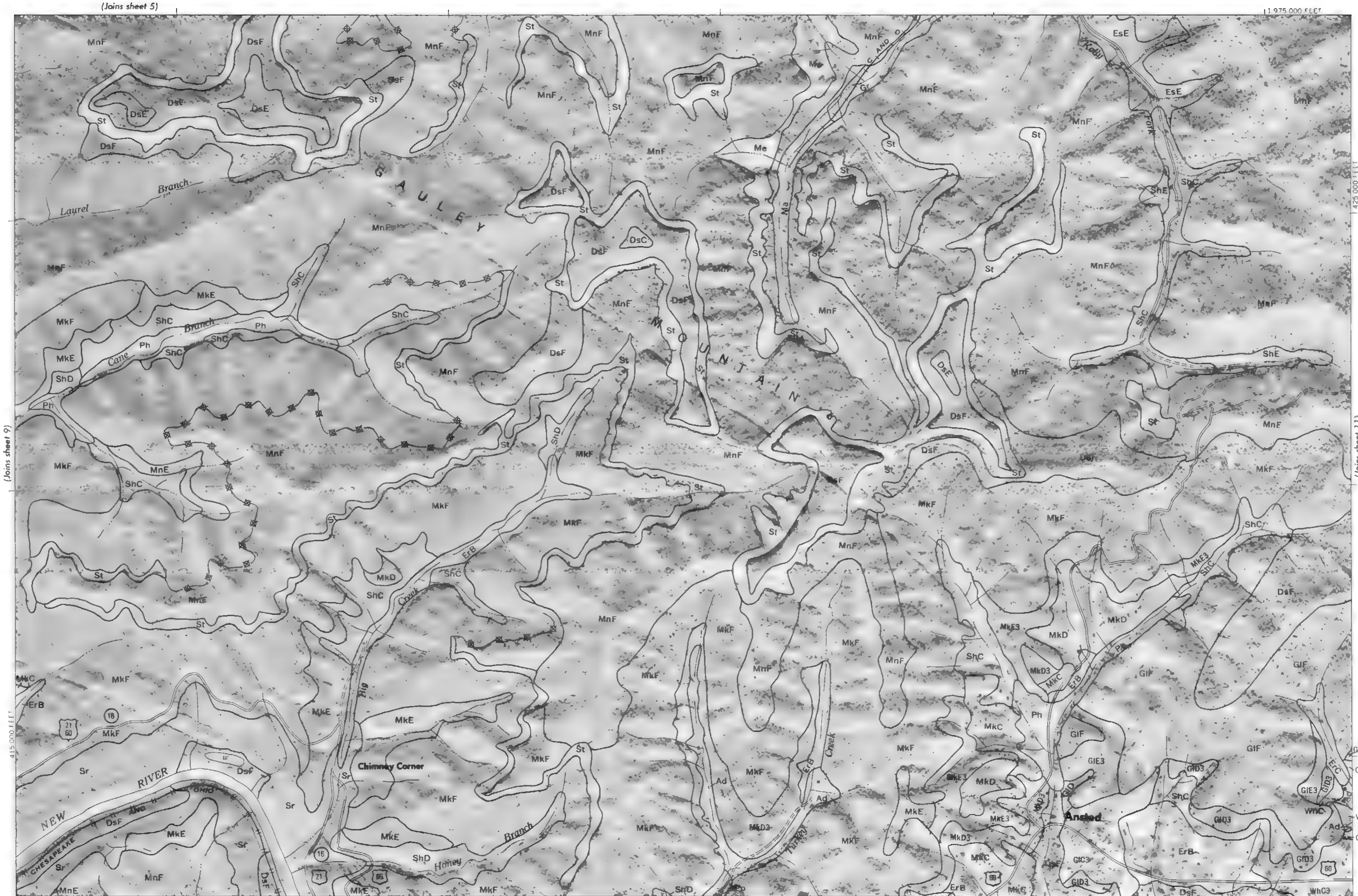
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture ... and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

N

1 Mile

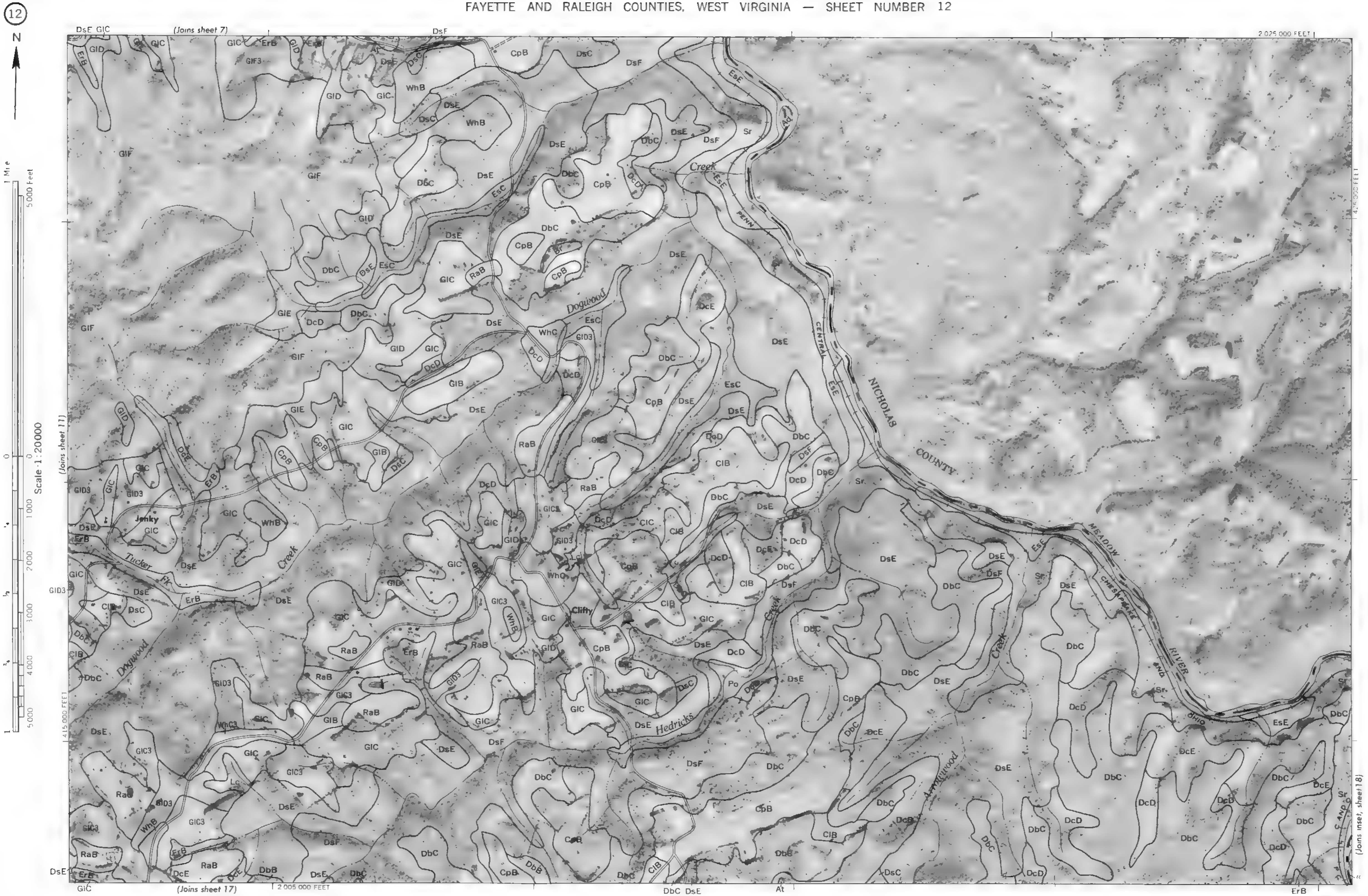
5000 Feet

Scale 1:20000

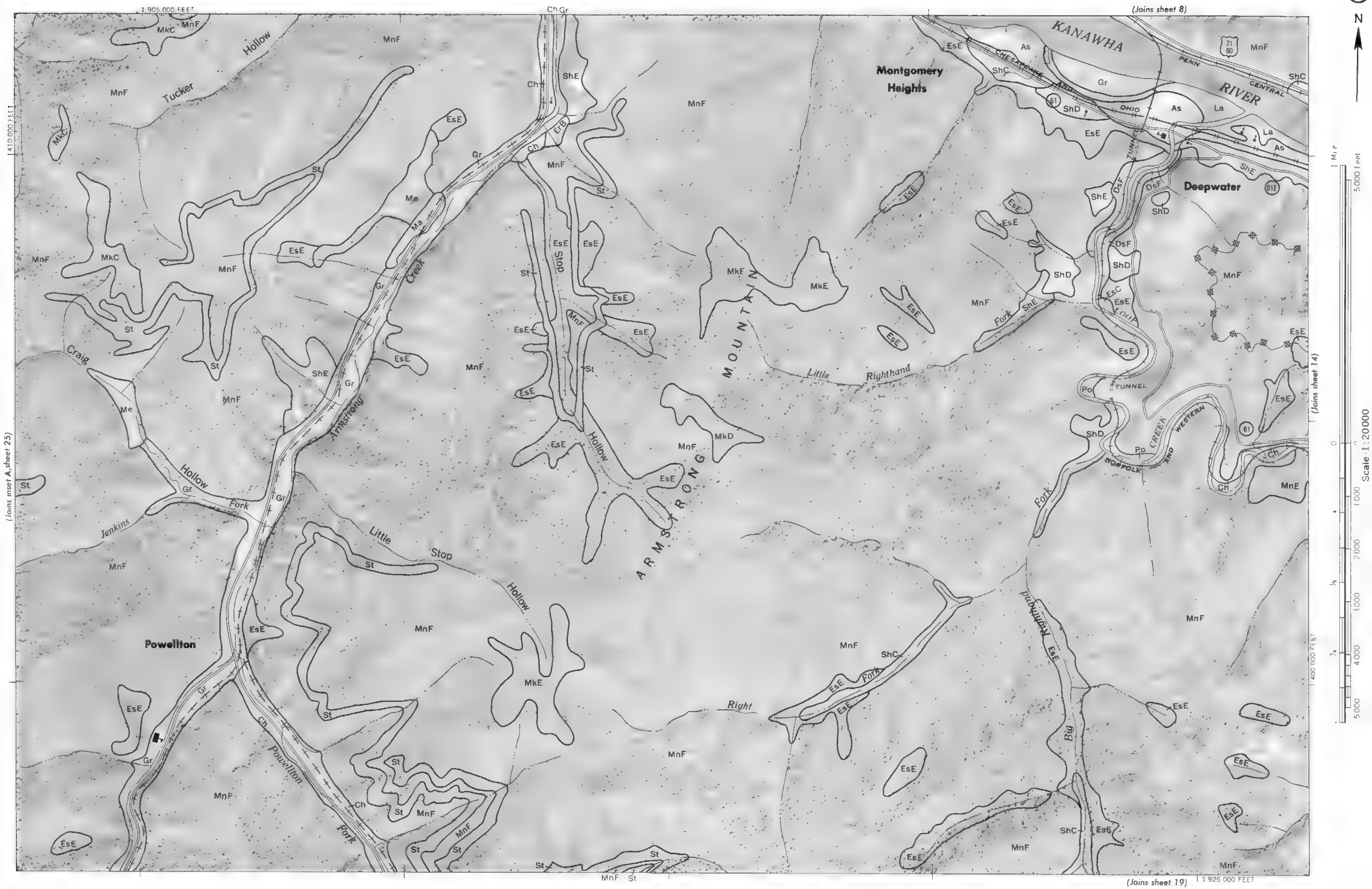


Photobase from 1957 1958 and 1969 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service and the West Virginia Agricultural Experiment Station.

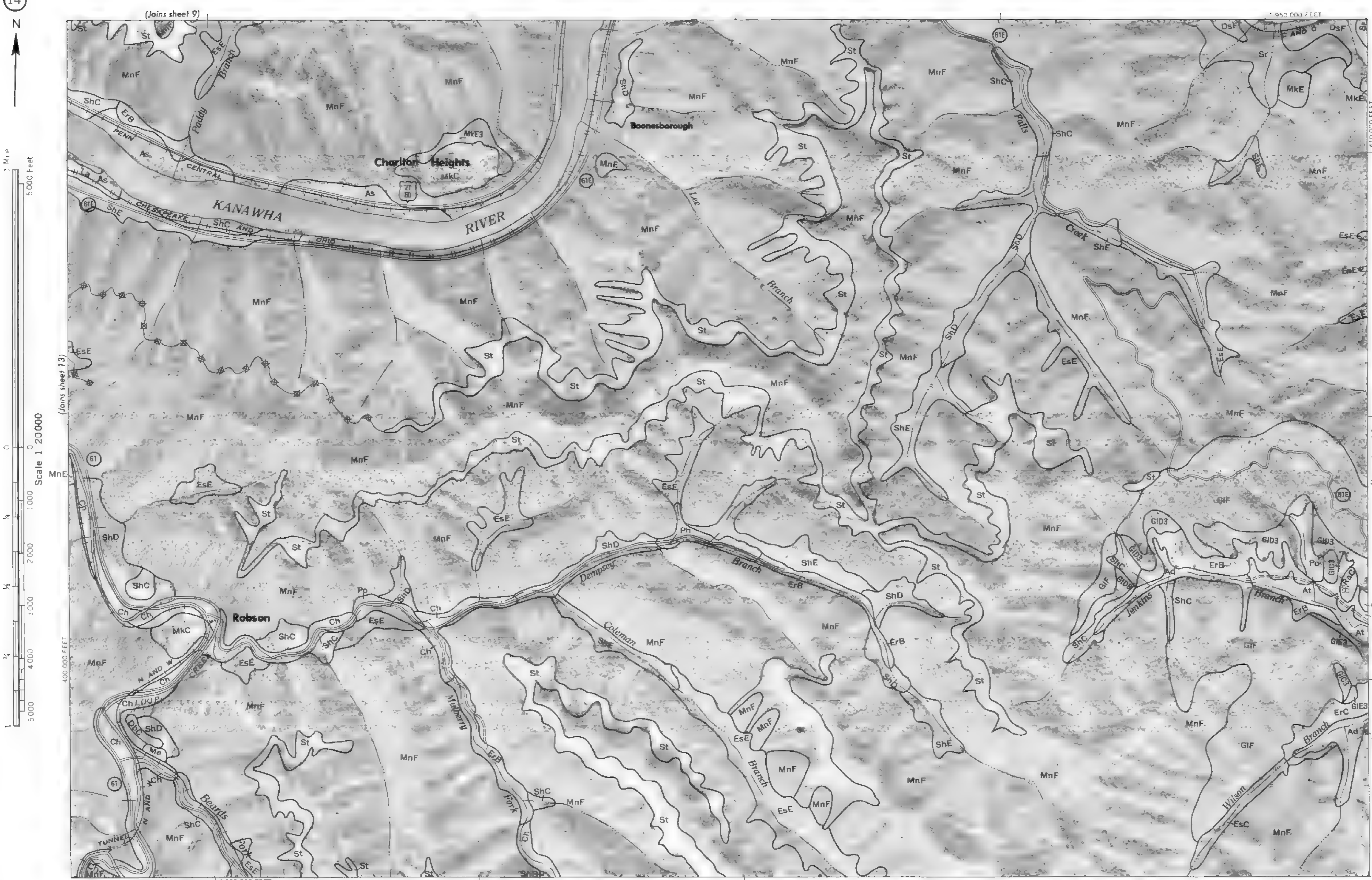

11
N
(Joins sheet 6)
(Joins sheet 10)
(Joins sheet 12)
(Joins sheet 16)
1 980 000 FEET
2 000 000 FEET
Ramsey
Dogwood
Ridge
Horseshoe
Creek
Sugar
Creek
Shade
Creek
Osborne
Creek
Tucker
Creek
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000



Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.



This map is one of a set compiled in 197[illegible] as part of a soil survey by the United States Department of Agriculture, [illegible] and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958 and [illegible] aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, [illegible]

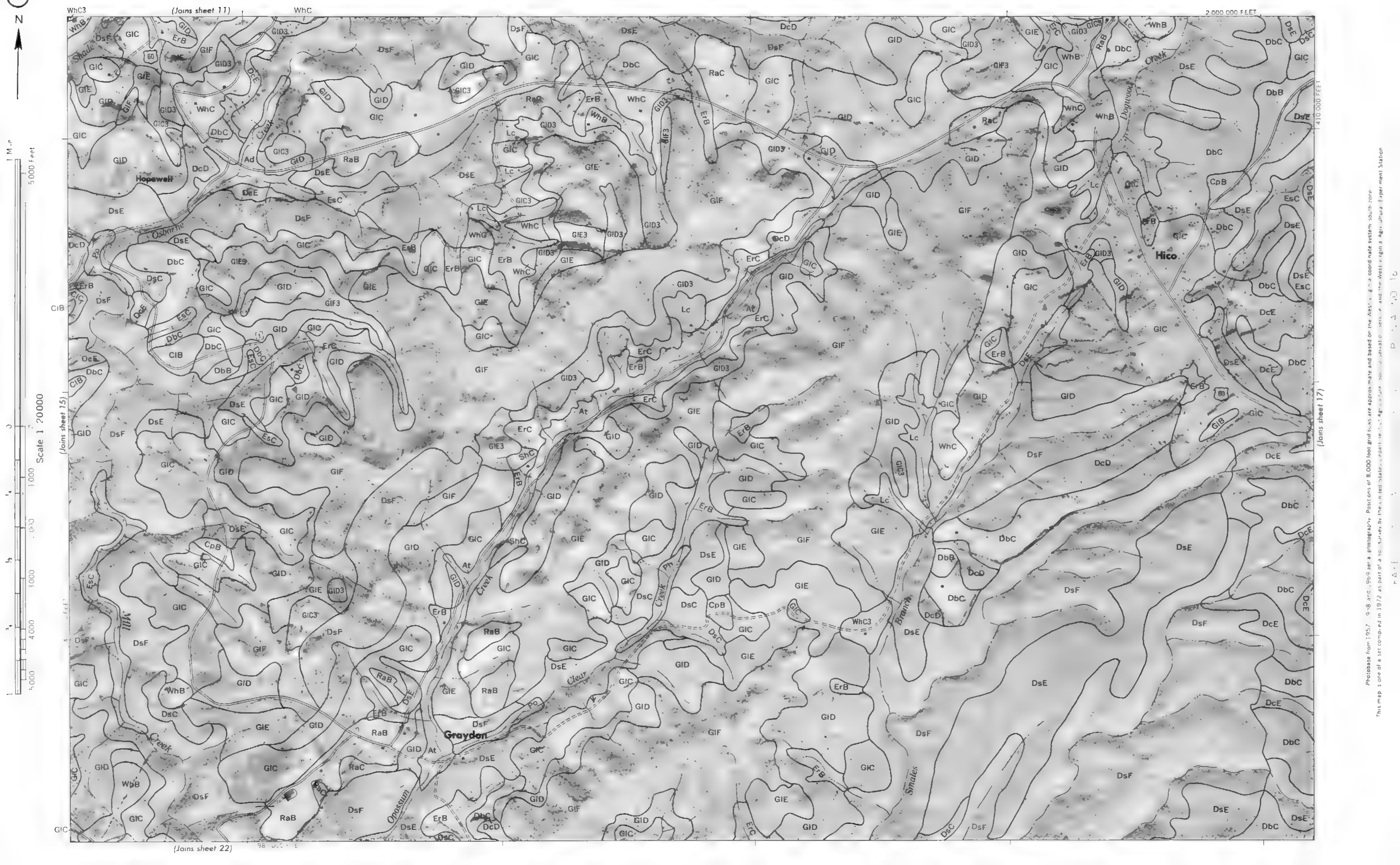


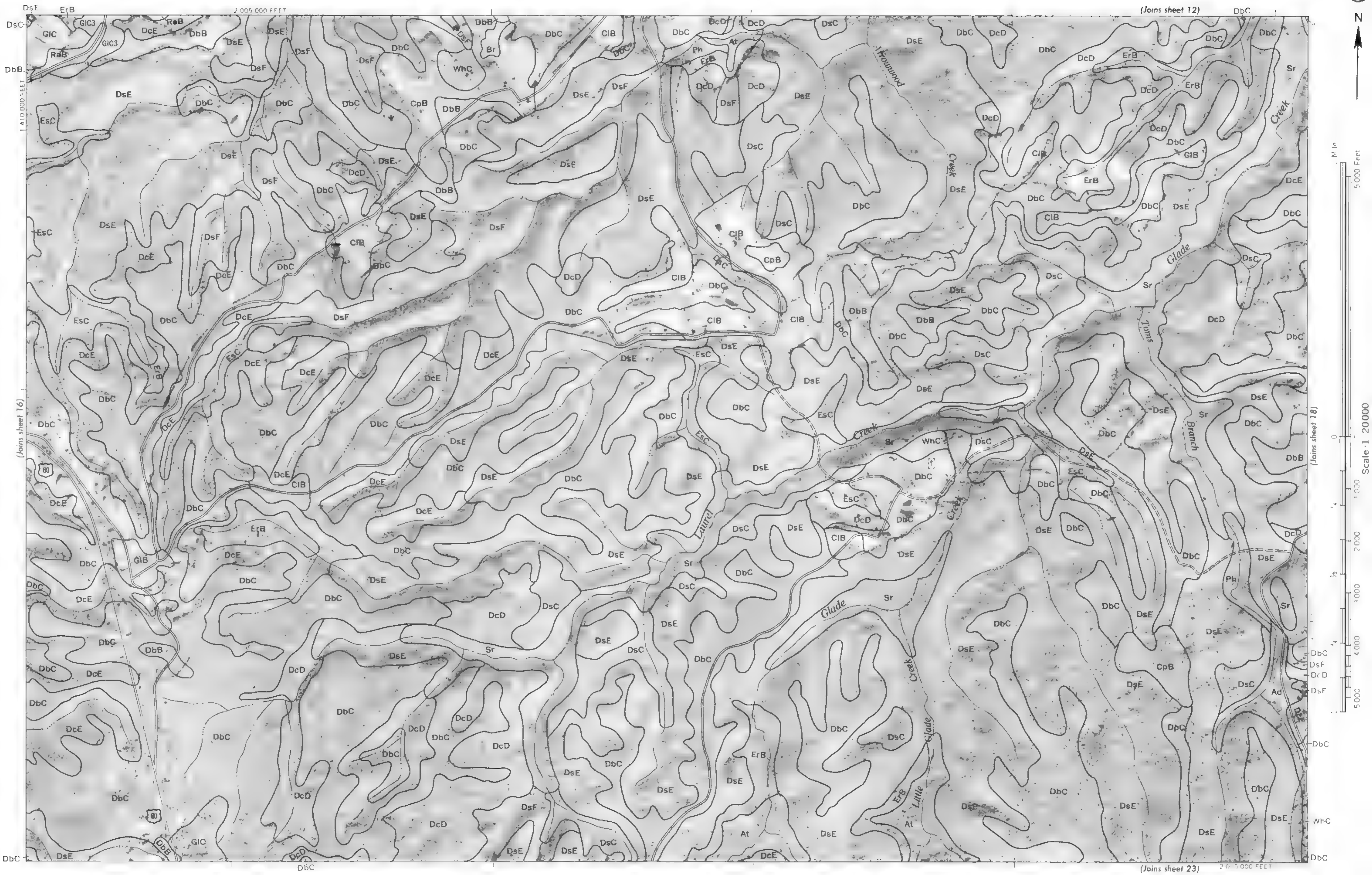
Photobase from 195?, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone

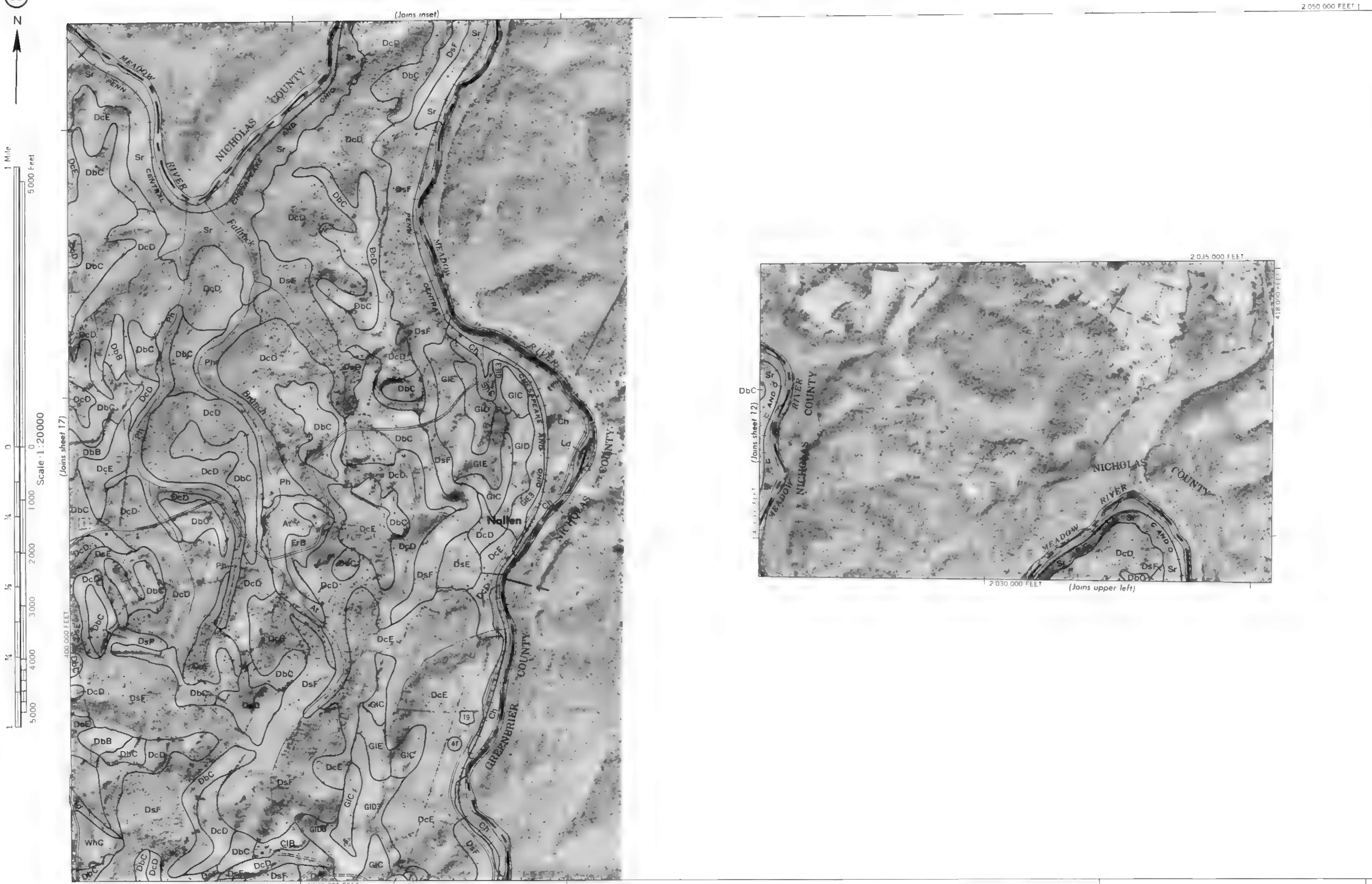
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station


(Joins sheet 10)
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 21)
1 950 000 FEET
1 975 000 FEET
410 000 FEET
400 000 FEET
N
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
NEW RIVER
CHESAPEAKE AND OHIO
Cotton Hill
Beckwith
Turkey Creek
Mill Creek
Laurel Creek
Shade Cr
Jenkins Branch
Wilson
MnF
MkE
EsE
DsF
Sr
MkD
DsC
GlC
GlD
GlE
GlF
WhB
WhC
DbC
DcD
CpB
ErB
MkC
MkF
ShC
RaB
RaC
ClB

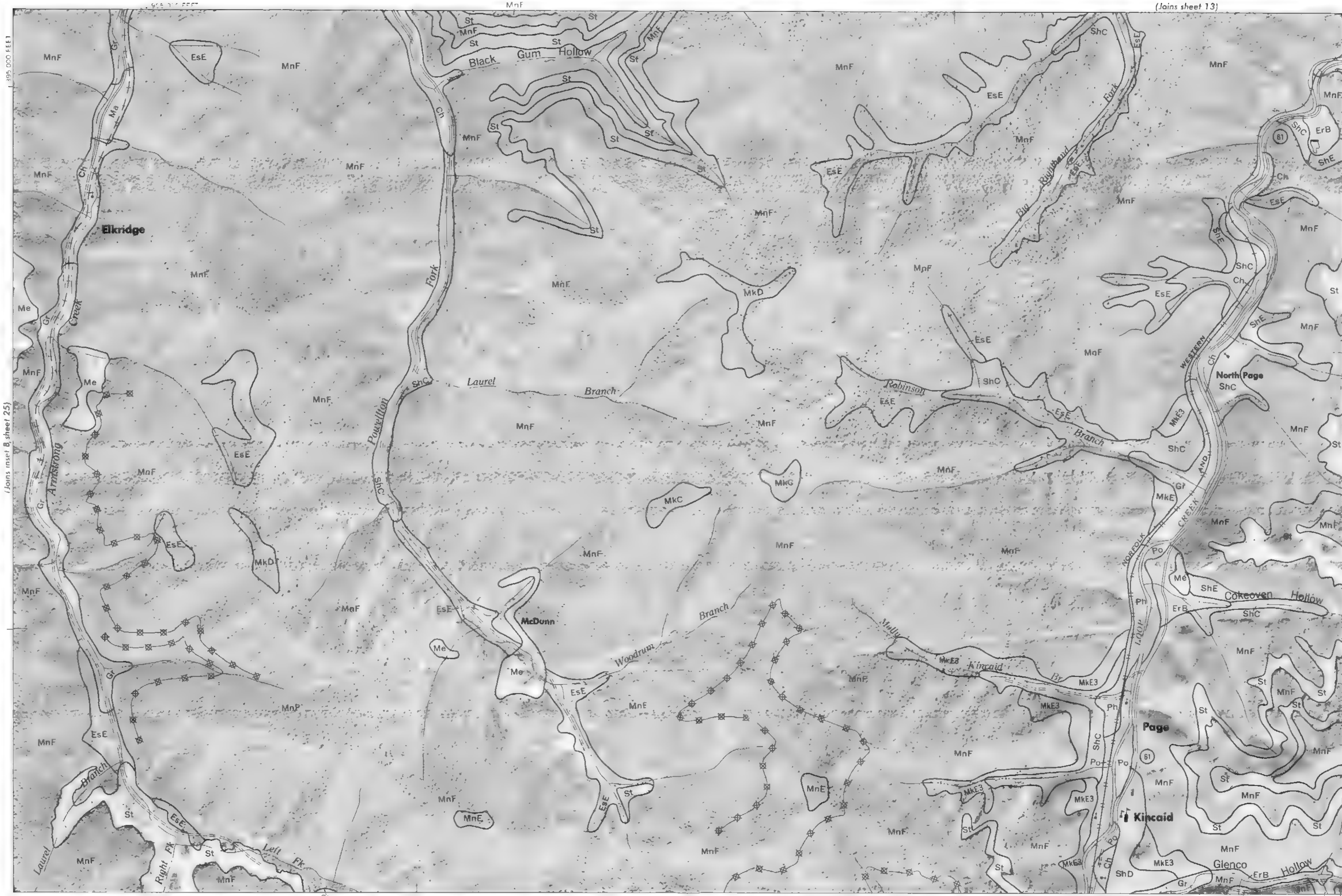
FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA — SHEET NUMBER 16




N
(Joins sheet 12)
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 23)
2 005 000 FEET
410 000 FEET
Scale 1:20000
5000 Feet
1 Mile
Wrownwood Creek
Glade Creek
Toms Branch
Laurel Creek
Little Glade Creek
Creek
60
DsE
DbC
DcE
DsF
DcD
DsC
ClB
ErB
EsC
DbB
CpB
GlC
GlC3
RaB
WhC
Sr
At
Ph
Br
Ad



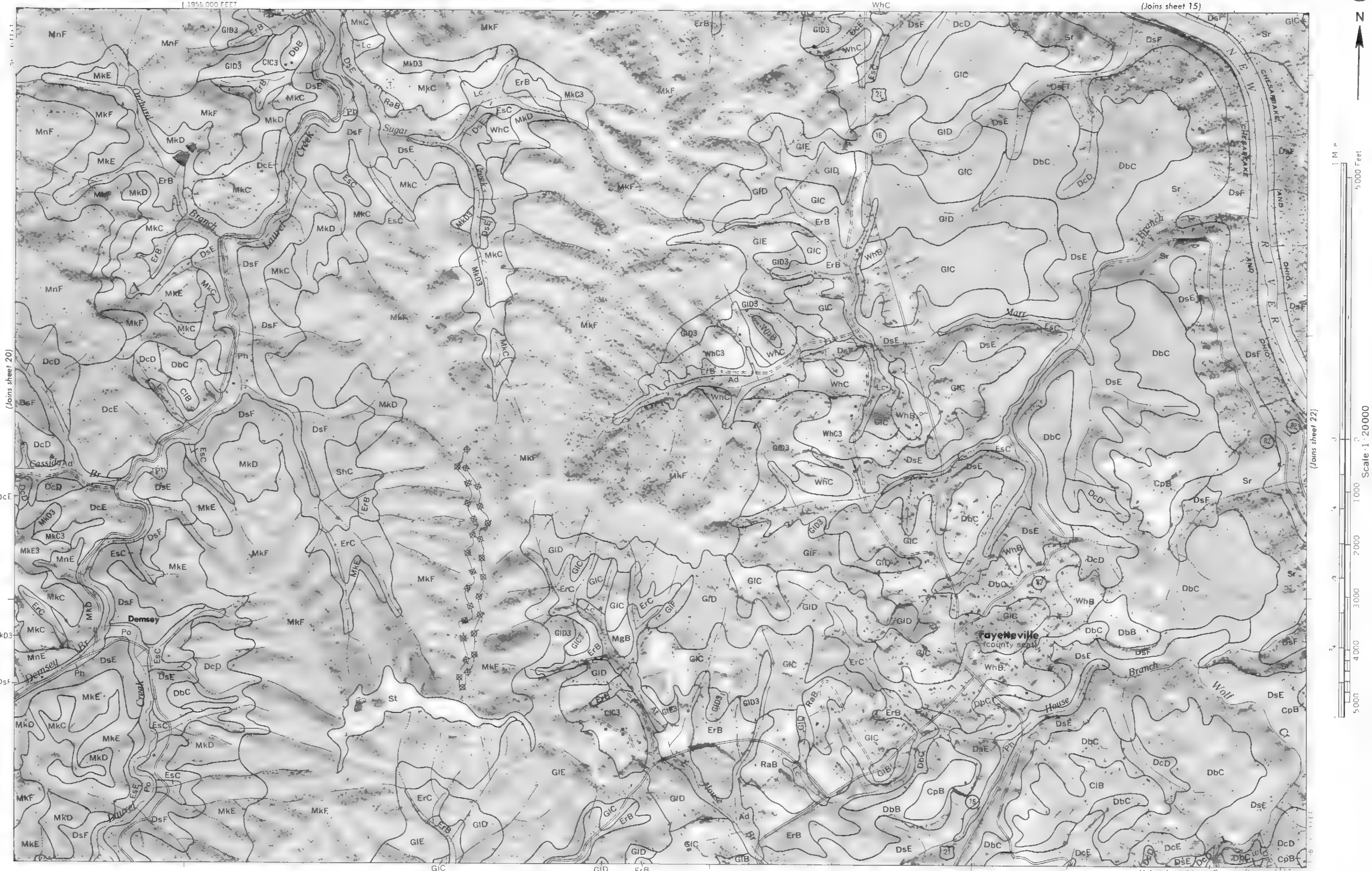
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

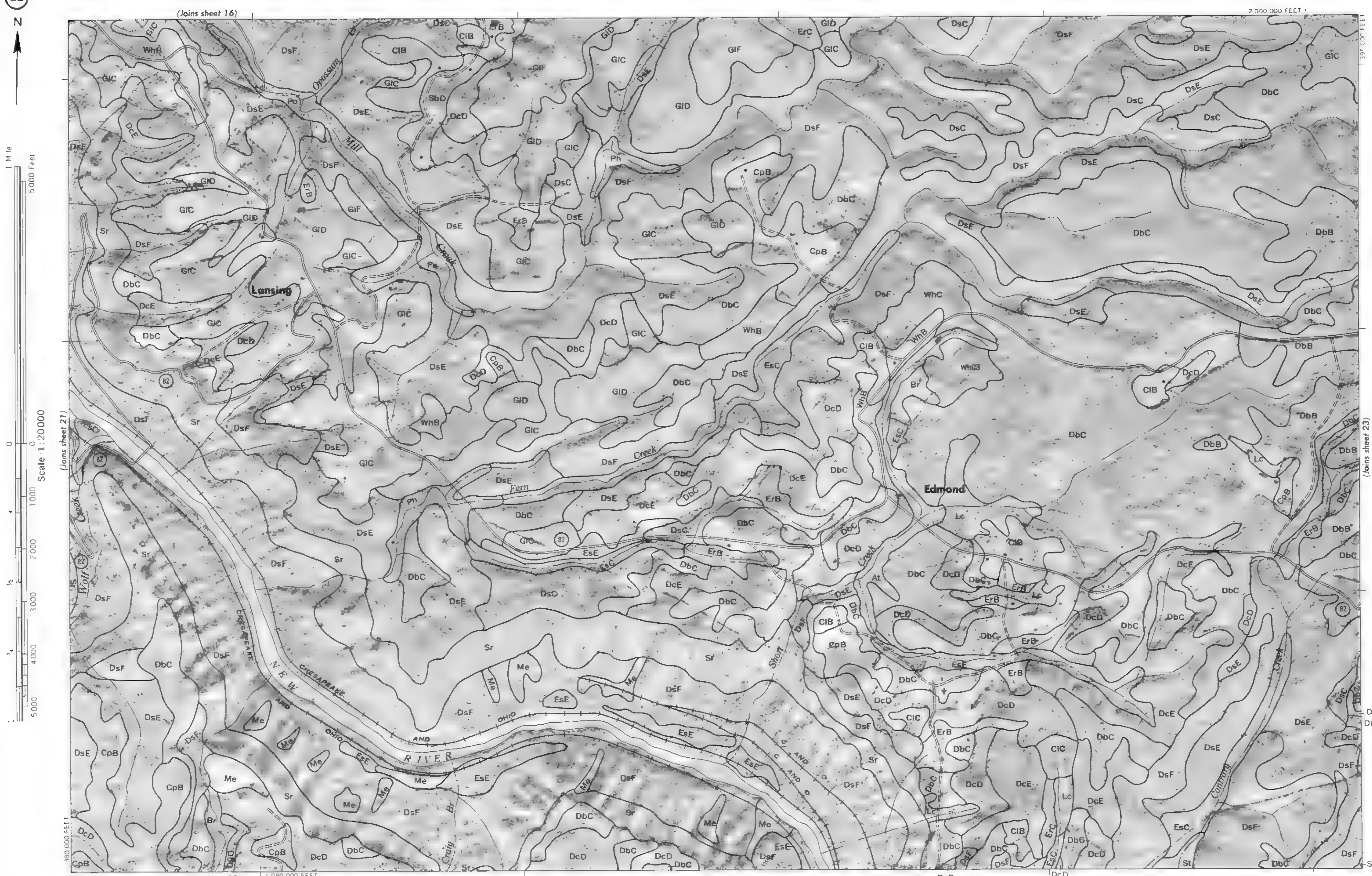


Photobase from 1975 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

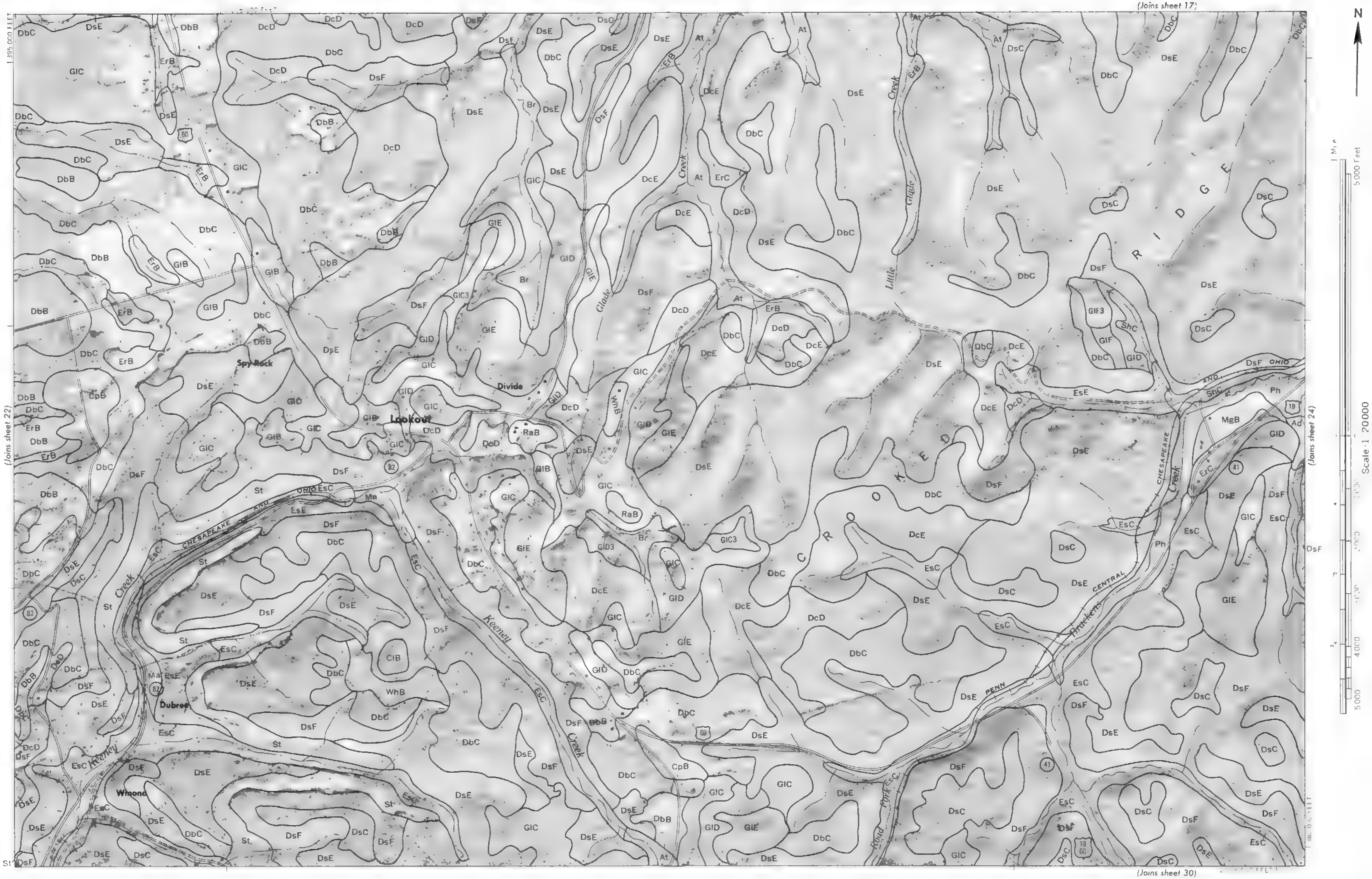
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.


1 955 000 FEET
(Joins sheet 15)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 28)
N
Scale 1:20000
1 Mile
5000 Feet
Fayetteville
(county seat)
Demsey
NEW RIVER
CHESAPEAKE AND OHIO
Orchard
Branch
Laurel
Creek
Sugar
Creek
Marr
Branch
Cassidy
Br.
Demsey
Br.
Creek
Laurel
House
Branch
Wolf
Cr.
House

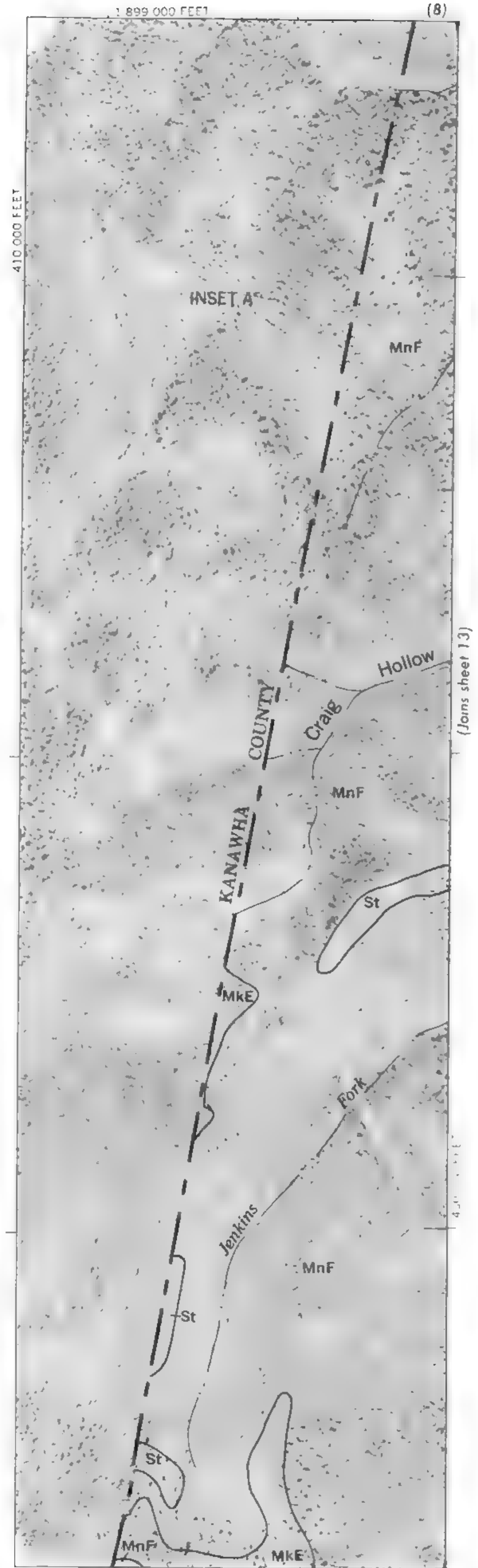


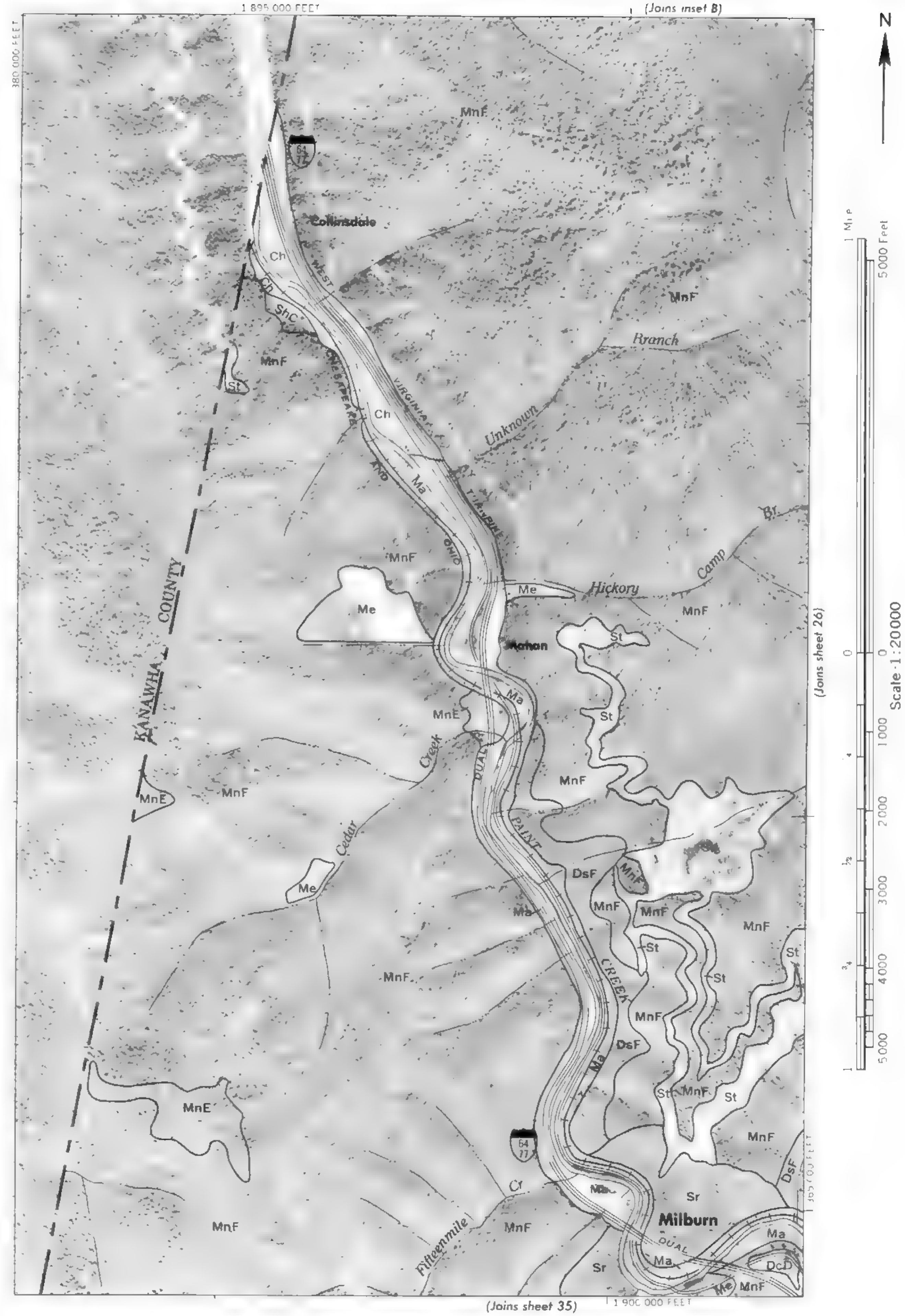
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.


(Joins sheet 17)
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 30)
N
Scale 1:20000
5000 Feet
Spy Rock
Divide
Lookout
Dubree
Winona
Glade Creek
Little Glade Creek
Keeney Creek
Chesapeake Creek
Brackens Creek
Road Fork
CROOKED RIDGE
CHESAPEAKE AND OHIO
PENN CENTRAL

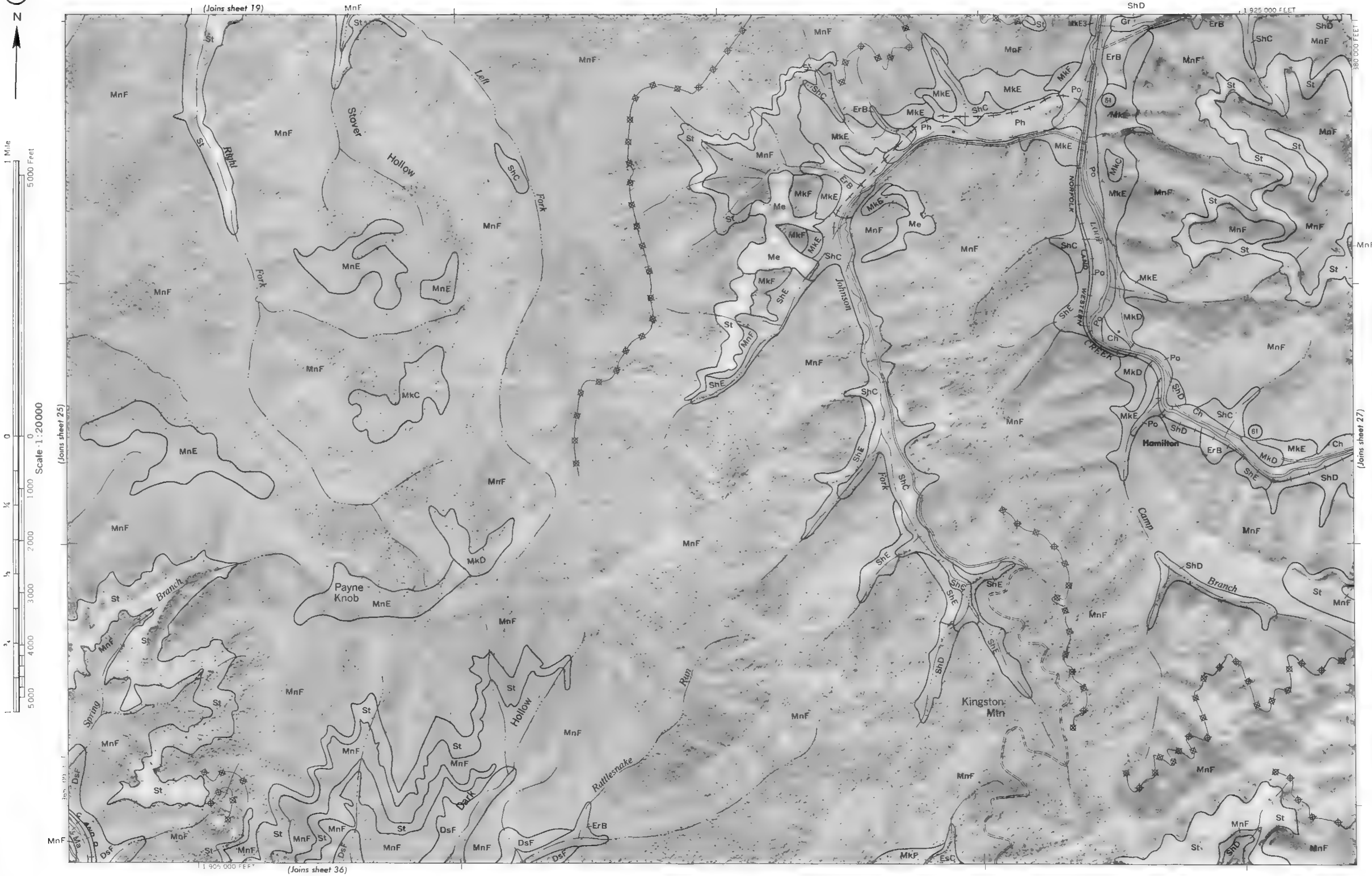
Photobase from 1957, 1966 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.





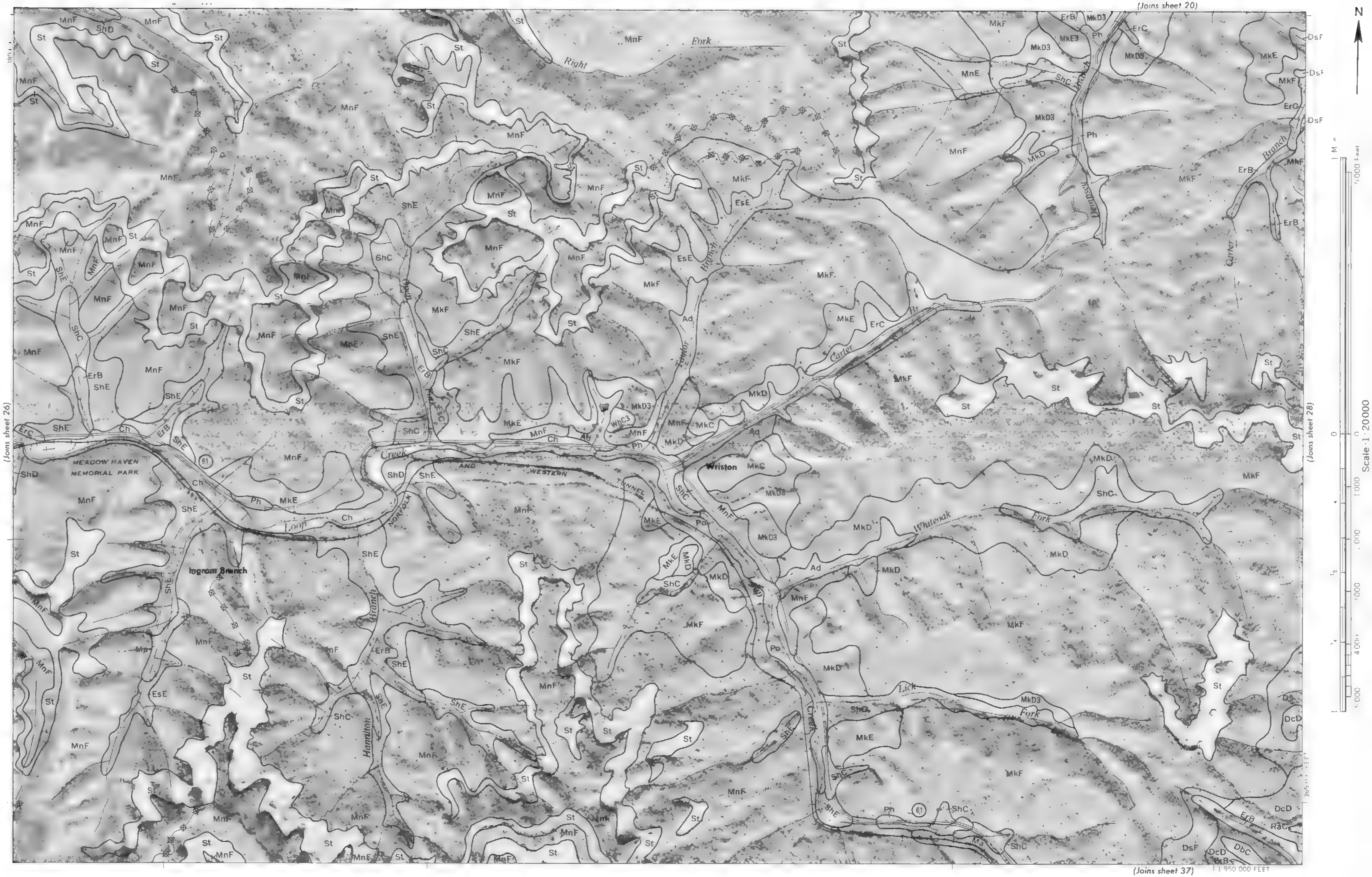
This map is one of a set compiled in 19[illegible] as part of a soil survey by the United States Department of Agriculture [illegible] and the West Virginia Agricultural Experiment Station

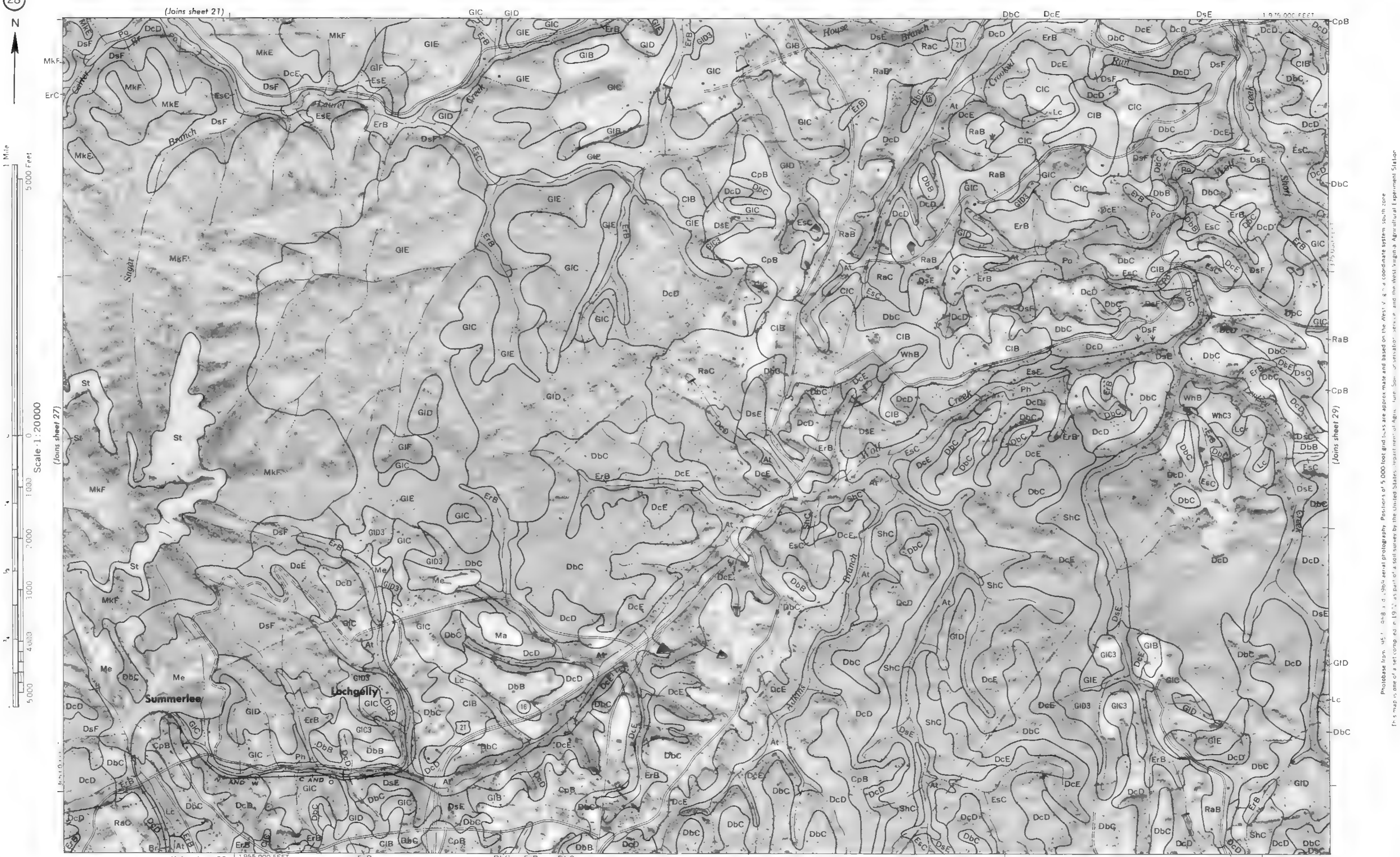
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the West Virginia coordinate system south zone



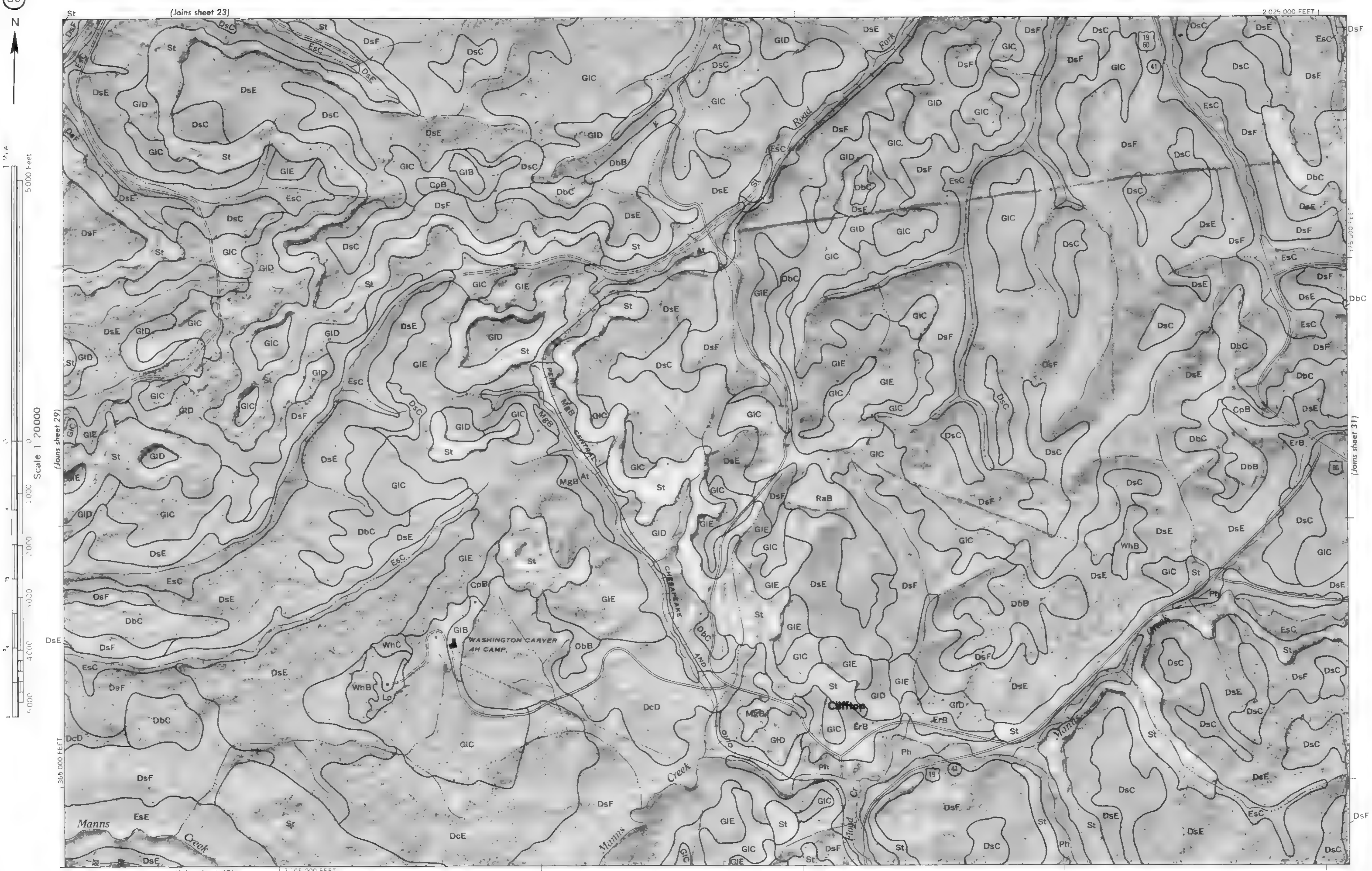
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.


(Joins sheet 20)
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 37)
N
Scale 1:20000
MEADOW HAVEN MEMORIAL PARK
Wriston
Ingram Branch
Right Fork
Loop Creek
NORFOLK AND WESTERN
TUNNEL
Whiteoak Fork
Carter Br
Carter Branch
Dempsey Branch
Hamilton Branch
Lick Fork
Creek
61
1 950 000 FEET

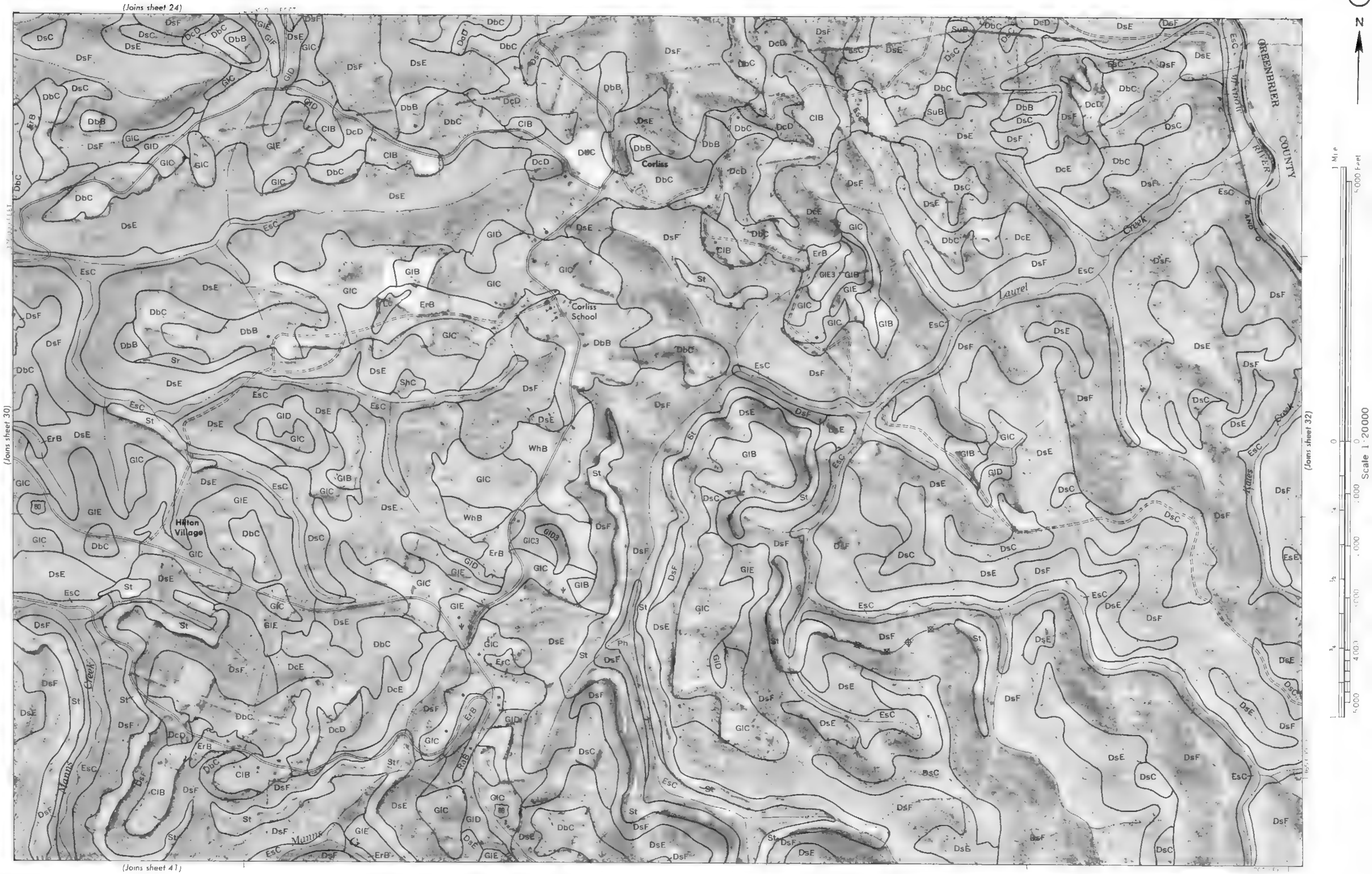

28
N
(Joins sheet 21)
(Joins sheet 27)
(Joins sheet 29)
(Joins sheet 38)
Scale 1:20 000
1 Mile
5 000 Feet
Summerlee
Lochgelly
Laurel
Creek
Branch
House
Run
Wolf
Creek
Short
Creek
Branch
1 955 000 FEET
1 975 000 FEET


(Joins sheet 22)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 39)
N
Scale 1:20000
Gatewood
Keeneys Creek
Boone
NEW RIVER
CHESAPEAKE AND OHIO
Levisee Creek
Manns Creek
Keeney Creek
Craig Branch
Butcher Branch
Contrary Cr
Coal Run
2 000 000 FEET



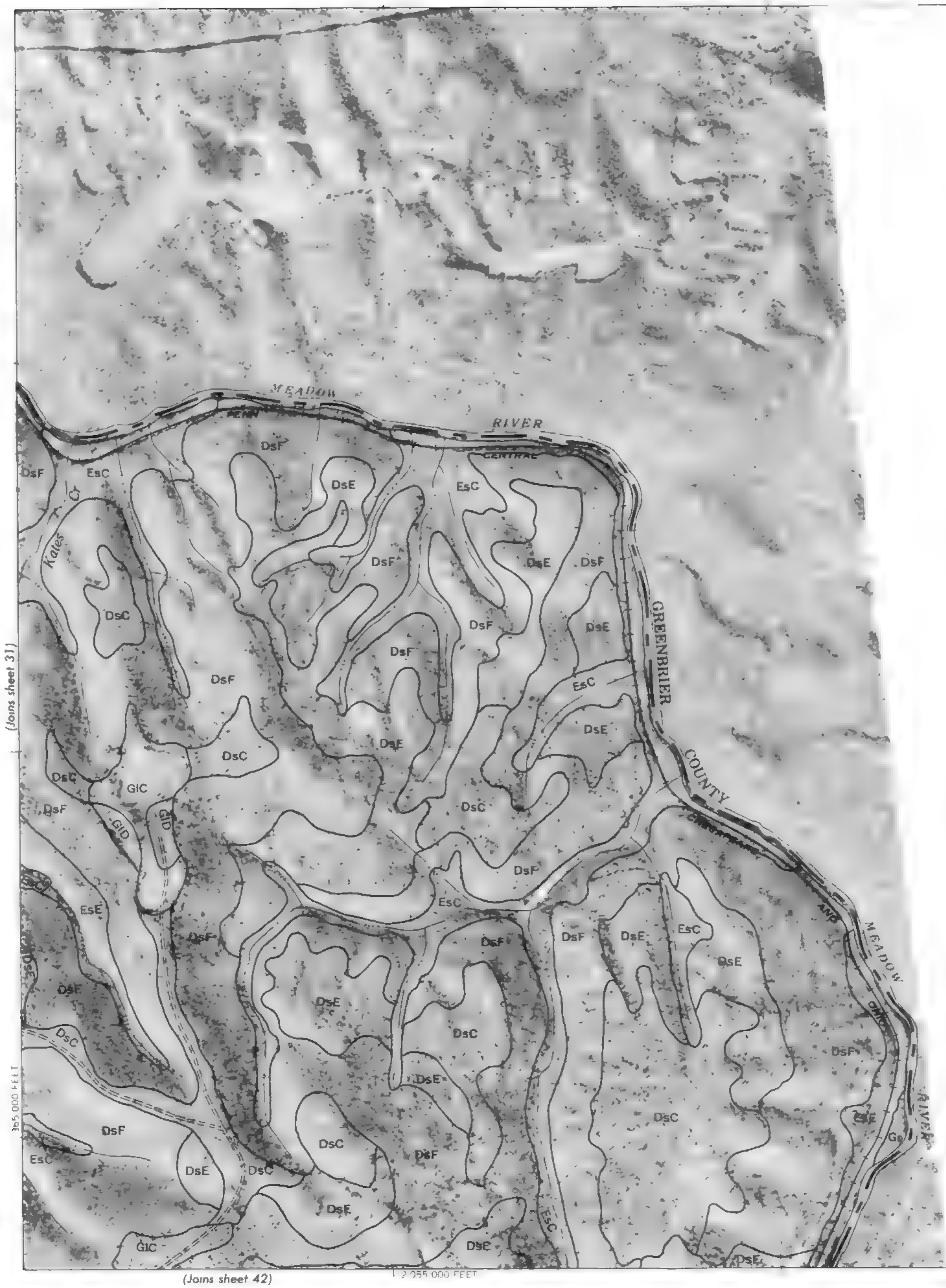
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.



[illegible] Photobase from [illegible] and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone

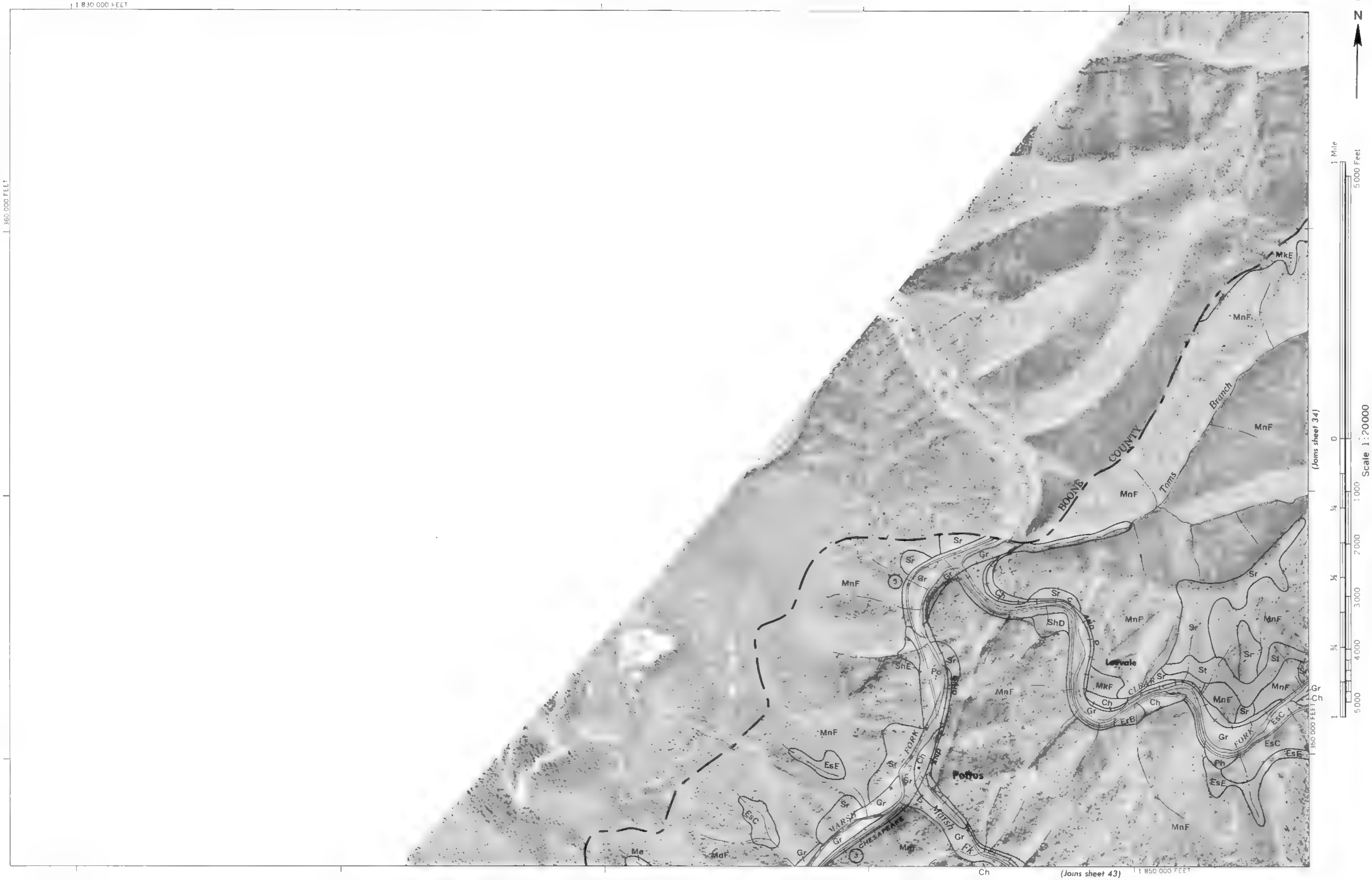
FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA — SHEET NUMBER 32



Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

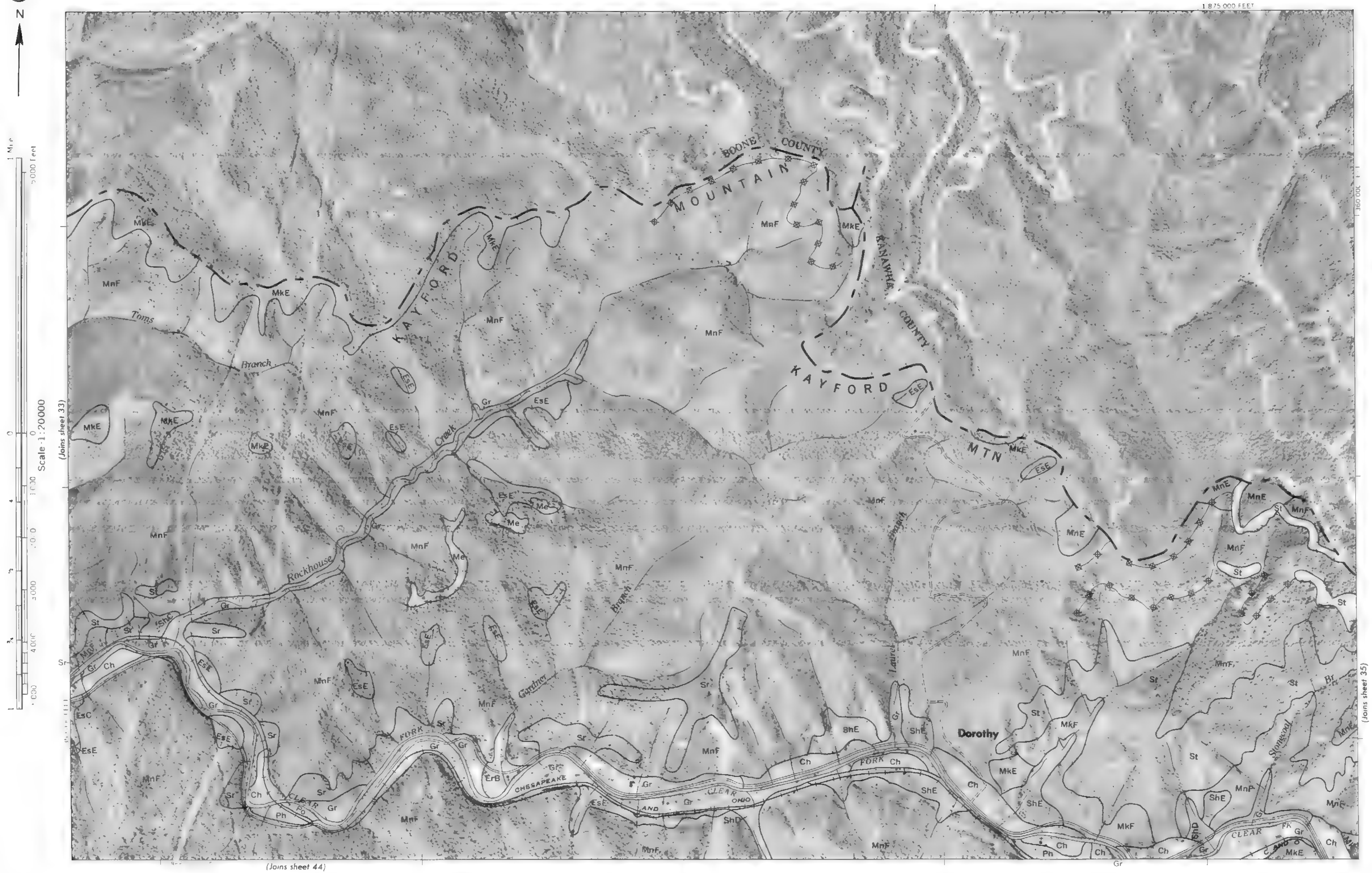
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

33



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

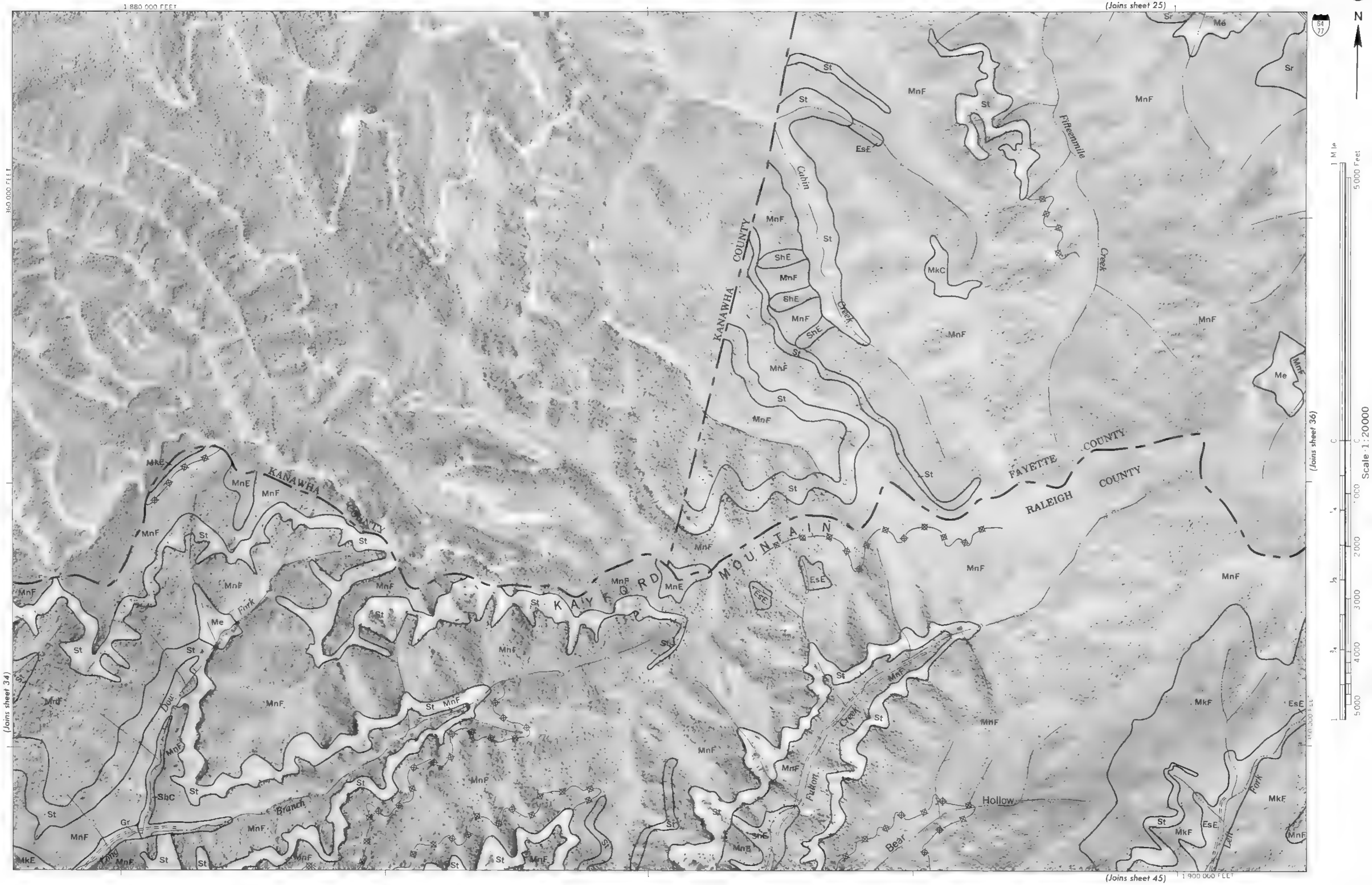
FAYETTE AND RALEIGH



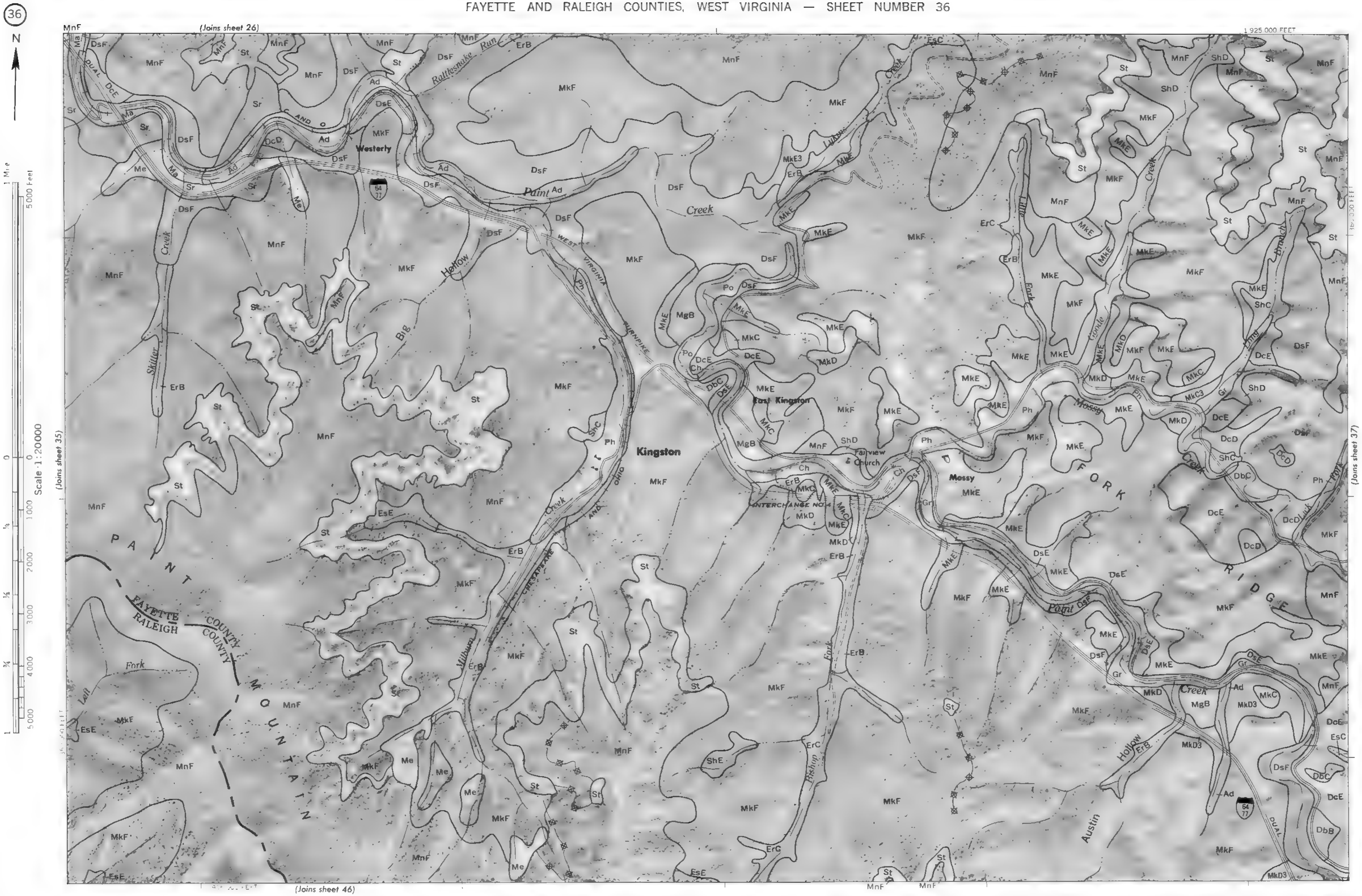
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

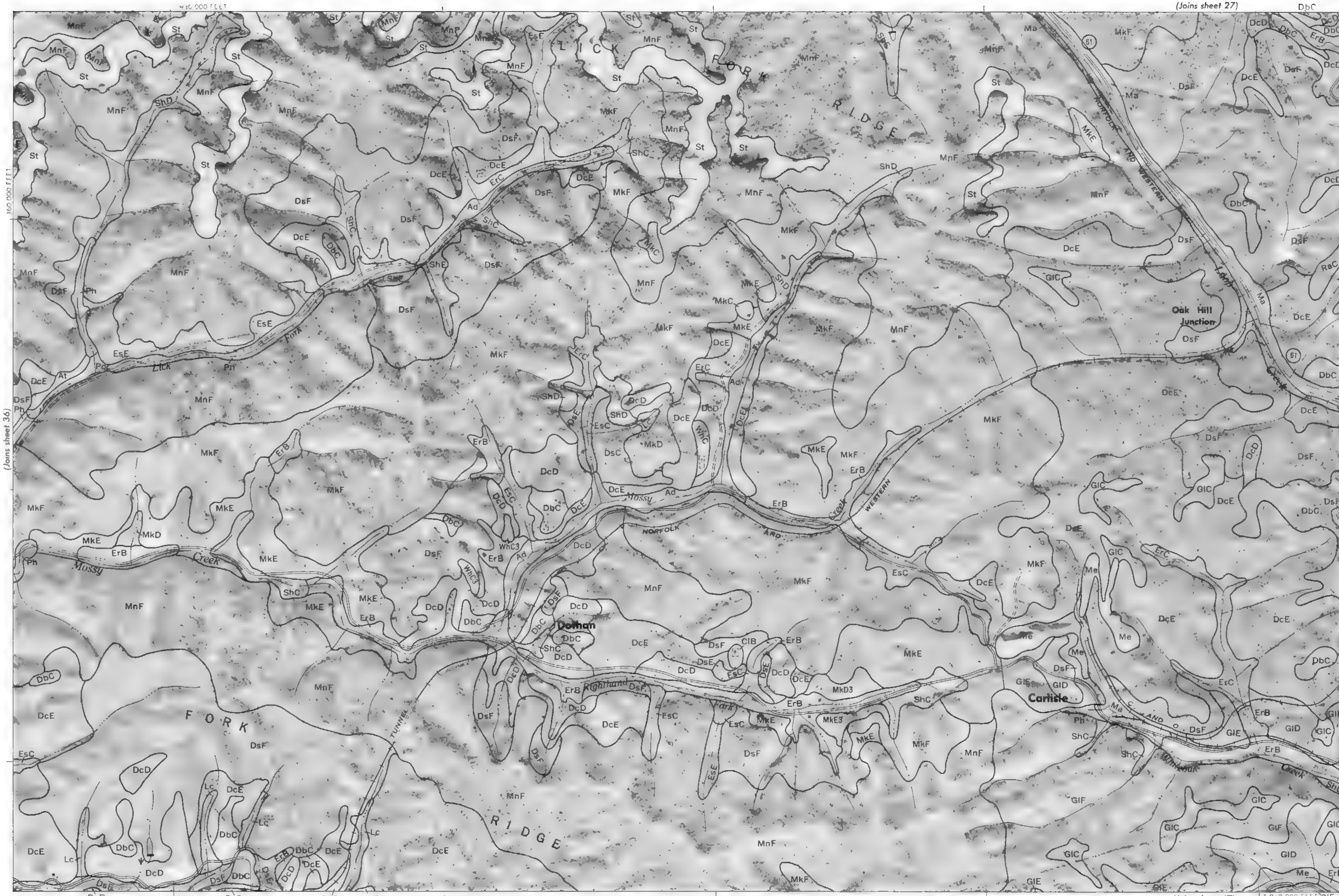
35



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture ... and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.



Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia grid coordinate system, south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.



Photobase from 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.


N
Scale 1:20000
5000 Feet
(Joins sheet 28)
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 48)
OAK HILL
UNSURVEYED AREA
CHESAPEAKE AND OHIO
Whipple
Greenstown
Peavine Ridge
Minersville
Concho
Sanger
Creek
RIVER

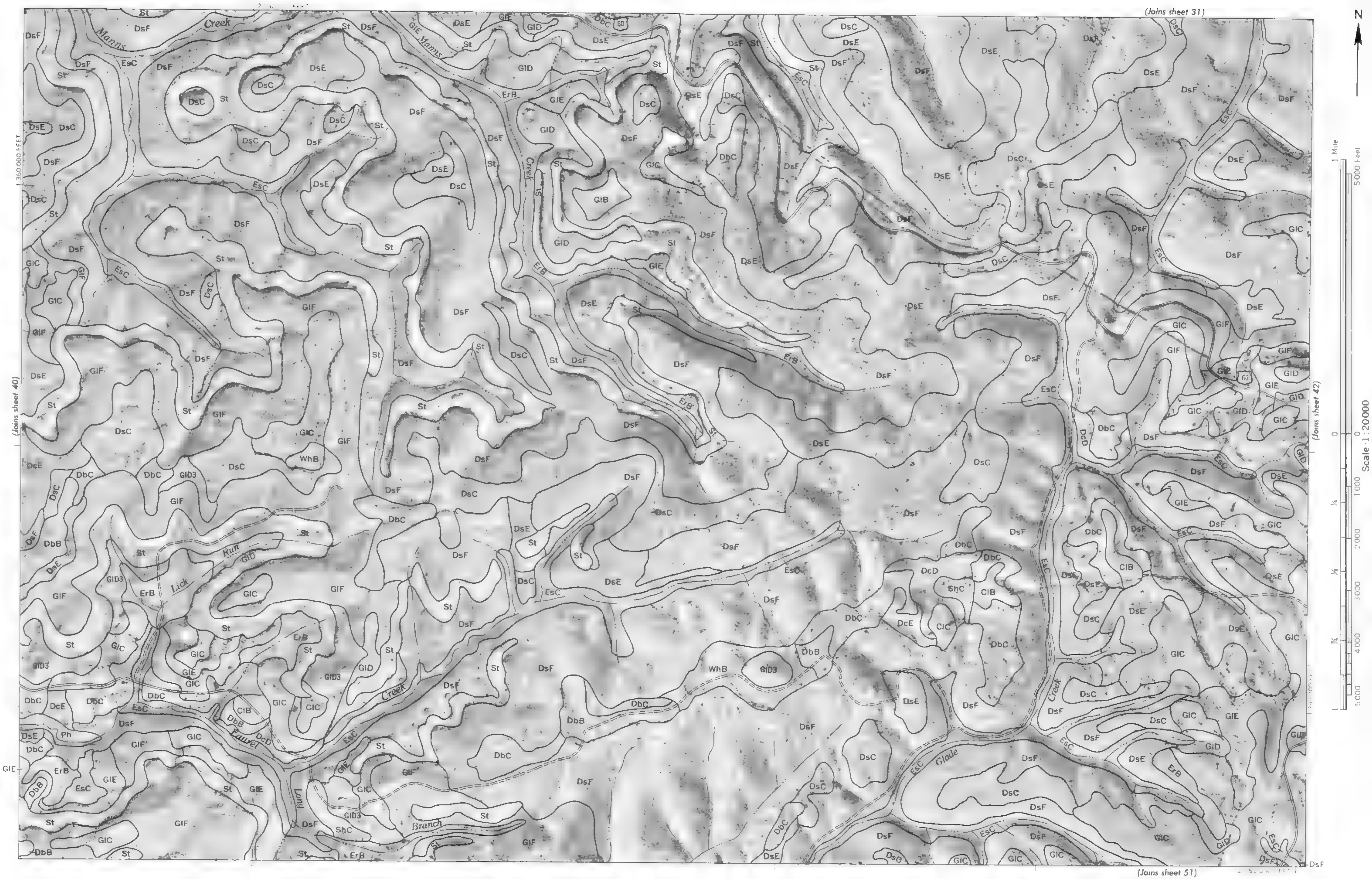

(Joins sheet 29)
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 49)
980 000 FEET
2 000 000 FEET
350 000 FEET
N
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
Sewell
Thurmond
NEW RIVER
CHESAPEAKE AND OHIO
C AND O
Rush Run
Coal Run
Fire Cr.
Ephraim Creek
DsF
DsE
DbC
GlC
St
Sr
EsC
EsE


(Joins sheet 30)
(Joins sheet 39)
(Joins sheet 41)
(Joins sheet 50)
N
1 Mile
5 000 Feet
Scale 1:20000
2 025 000 FEET
Manns
Glade
Creek
Floyd
Davis
Br
Landisburg
CHESAPEAKE AND OHIO
CENTRAL
PENN
Laurel
Sidenstricker
Branch
Butter
Br

41

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station

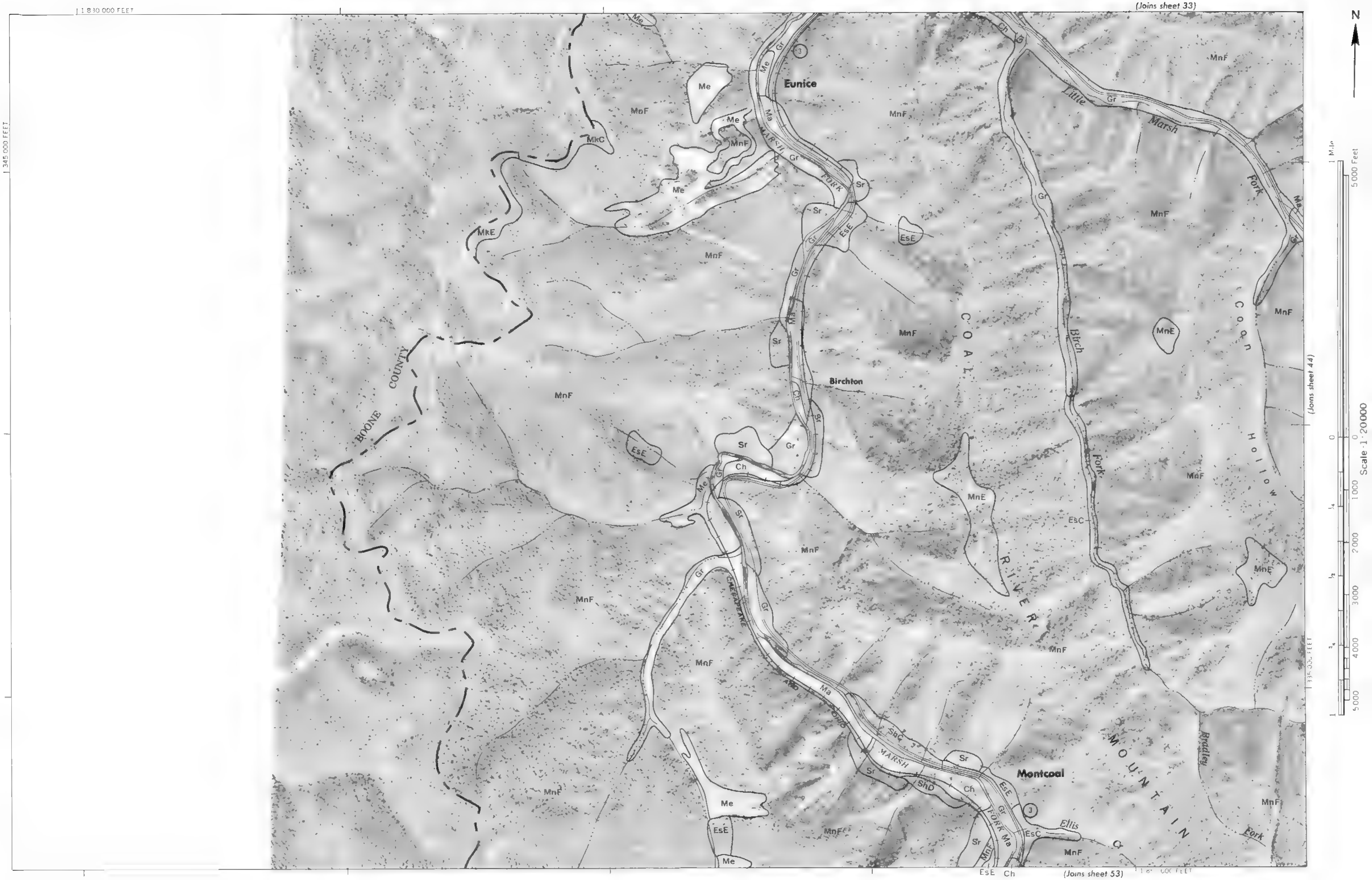
Photobase from 1957, 1958, and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone



Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 42



FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 43

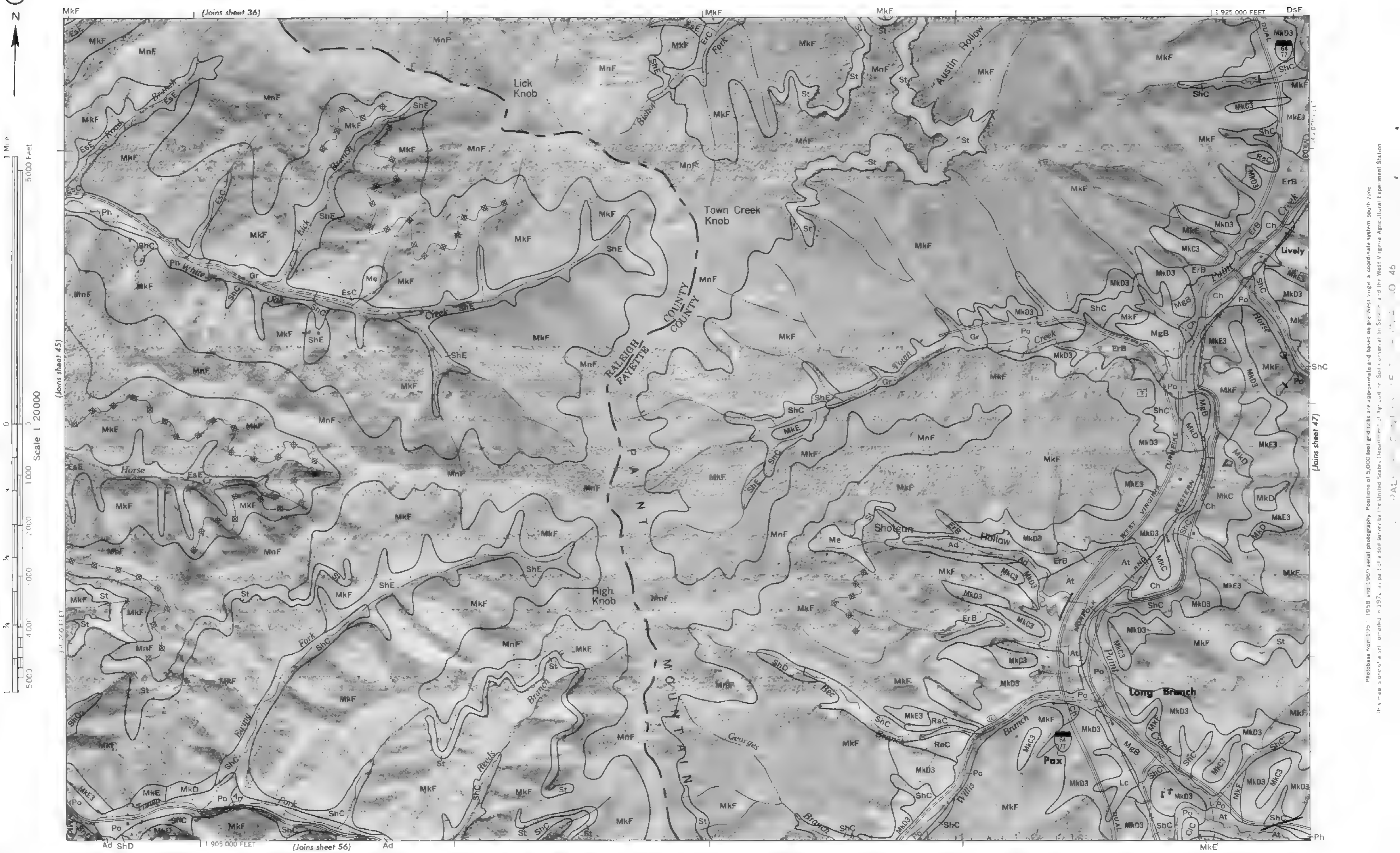
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

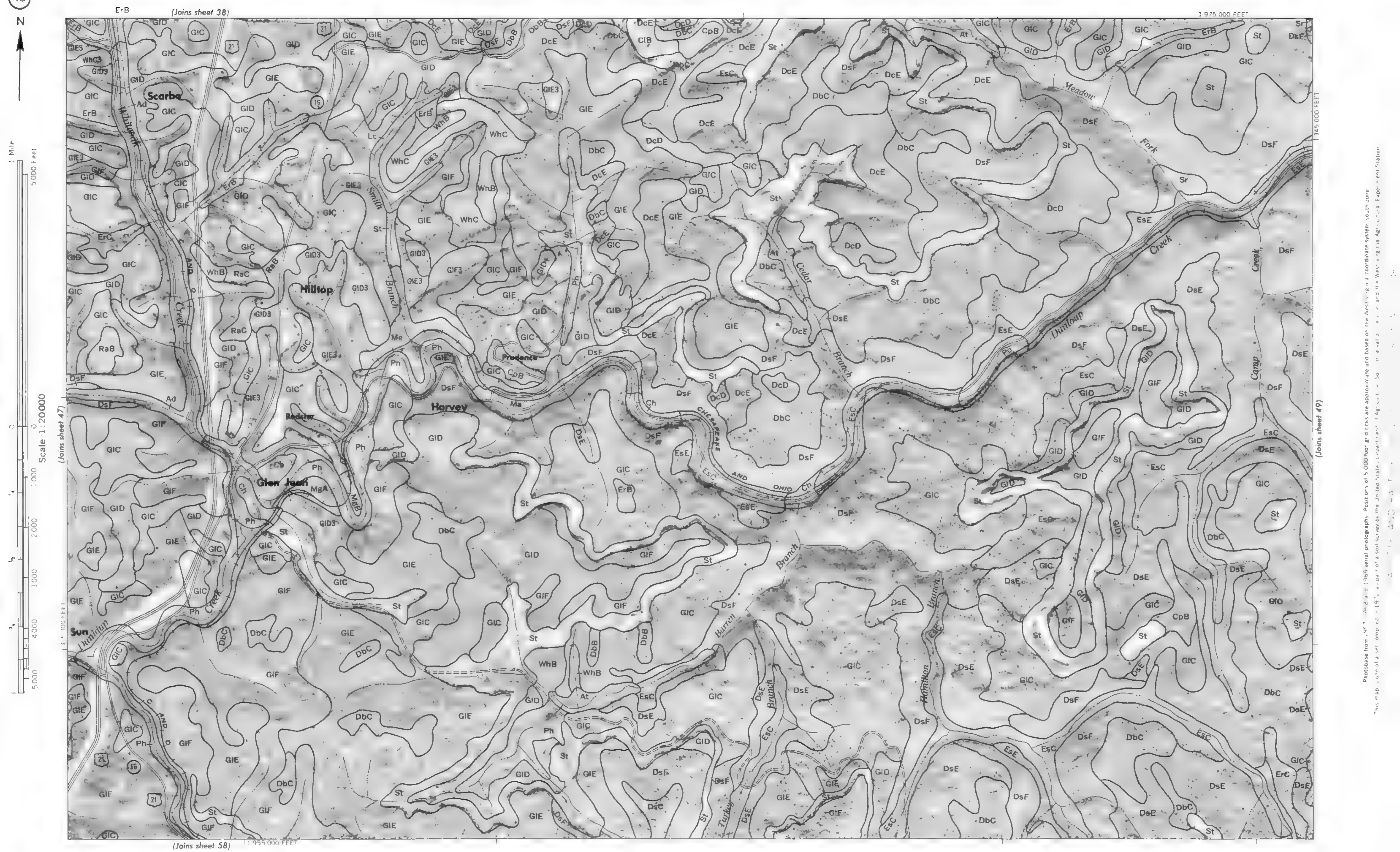
Photobase from 1957, 1958, and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

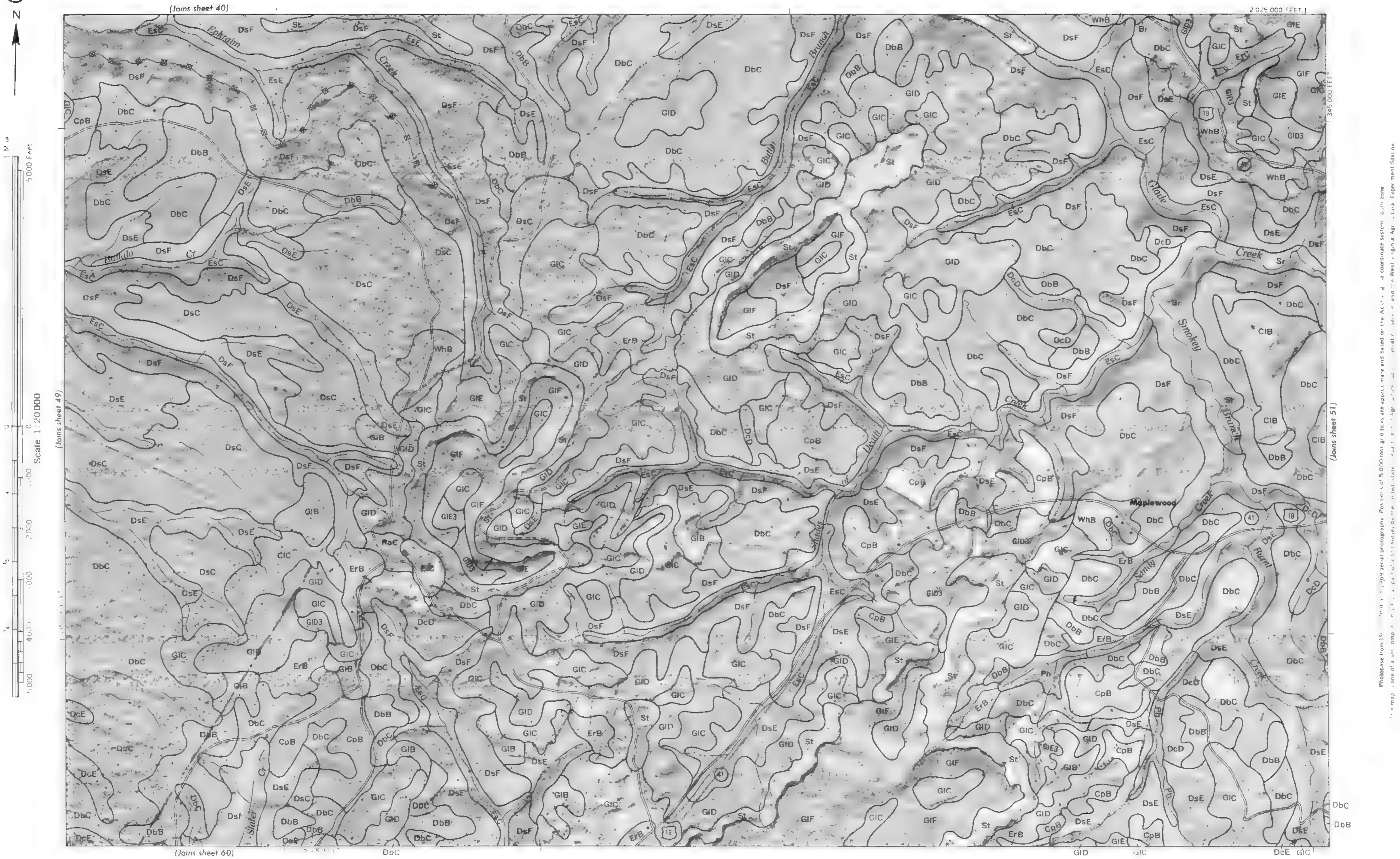
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.


46
N
(Joins sheet 36)
(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 56)
1 905 000 FEET
1 925 000 FEET
Scale 1:20000
1 Mile
5000 Feet
Lick Knob
Town Creek Knob
High Knob
RALEIGH COUNTY
FAYETTE COUNTY
PAINT MOUNTAIN
White Oak Creek
Lick Branch
Horse Creek
Bishop Fork
Austin Hollow
Town Creek
Shotgun Hollow
Bee Branch
Georges Branch
Willis Branch
Reeds Branch
Burrell Fork
Paint Creek
Long Branch
Lively
Pax
WEST VIRGINIA TURNPIKE
NORFOLK AND WESTERN
MkF
MnF
ShE
ShC
St
MkD3
MkE3
MkC3
ErB
Po
Ch
Gr
Ph
Ad
At
Me
EsE
EsC
RaC
MgB
ShD
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system south zone
This map is one of a set compiled in 1974 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station

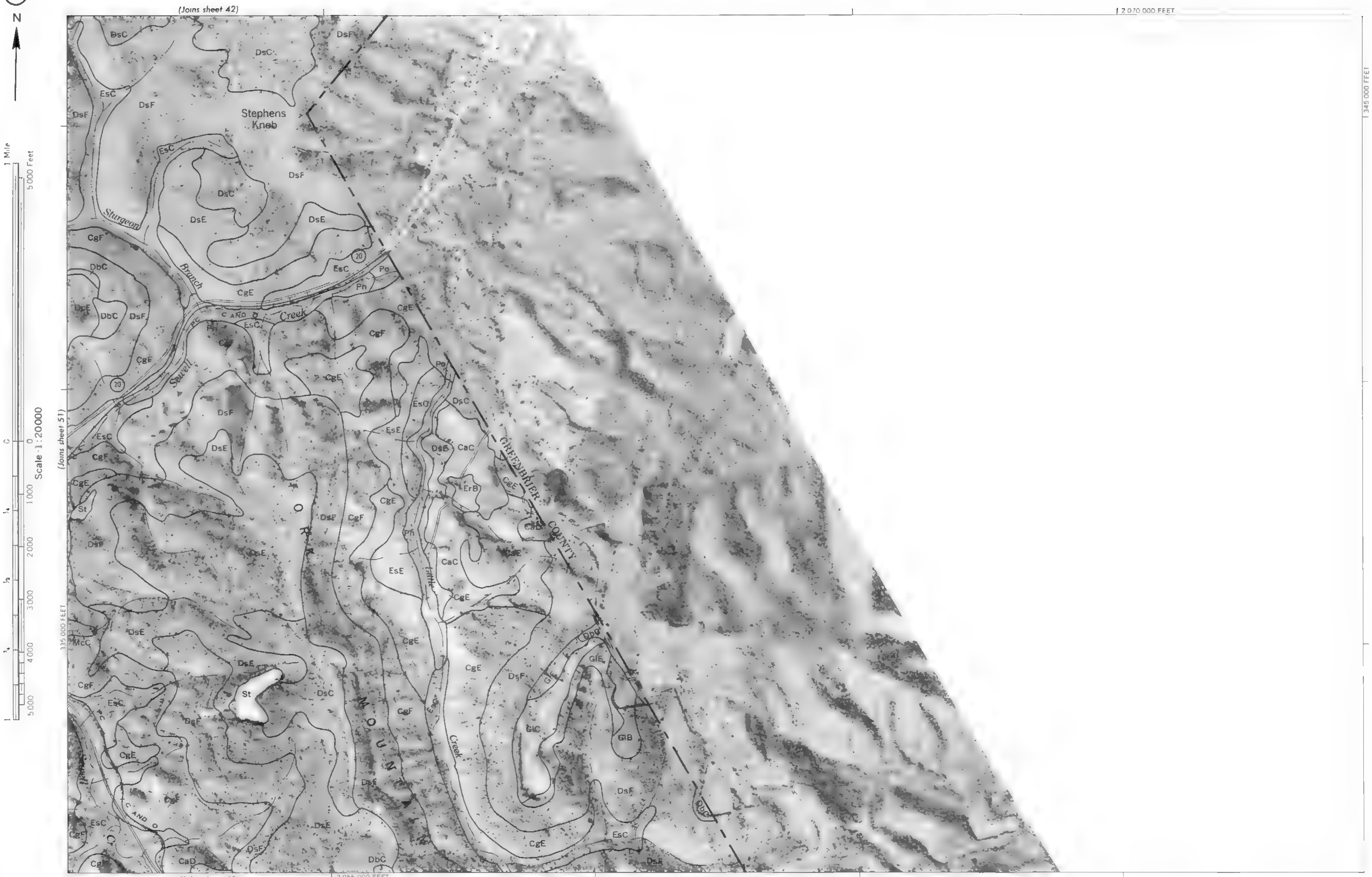
(Joins sheet 37)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 57)
PLUMORCHARD LAKE
PACKS MOUNTAIN
Horse Creek
Peach Bottom Branch
Bend Branch
NORFOLK AND WESTERN
Sun
N
Scale 1:20000
1 Mile
5000 Feet
345 000 FEET
1 950 000 FEET


48
N
(Joins sheet 38)
(Joins sheet 47)
(Joins sheet 49)
(Joins sheet 58)
1 975 000 FEET
345 000 FEET
1 955 000 FEET
Scale 1:20000
1 Mile
5000 Feet
Scarbro
Hilltop
Prudence
Harvey
Redstar
Glen Jean
Sun
Whiteoak Creek
Smith Branch
Meadow Fork
Dunloup Creek
Cedar Branch
Camp Creek
Burren Branch
Hamilton Branch
Turkey Branch
CHESAPEAKE AND OHIO


(Joins sheet 39)
(Joins sheet 48)
(Joins sheet 50)
(Joins sheet 59)
N
Stone Cliff
Claremont
NEW RIVER
CHESAPEAKE AND OHIO
Dunloup Creek
Fire Creek
Buffalo Creek
QUARRY
980 000 FEET
2 000 000 FEET
Scale 1:20000
1 Mile
5000 Feet


N
Scale 1:20000
5000 Feet
(Joins sheet 40)
(Joins sheet 49)
(Joins sheet 51)
(Joins sheet 60)
2 025 000 FEET
345 000 FEET
Ephraim
Creek
Buffalo
Cr
Butler
Branch
Glade
Creek
Smokey
Branch
Maplewood
Sandy
Creek
Slater
Glades
Death

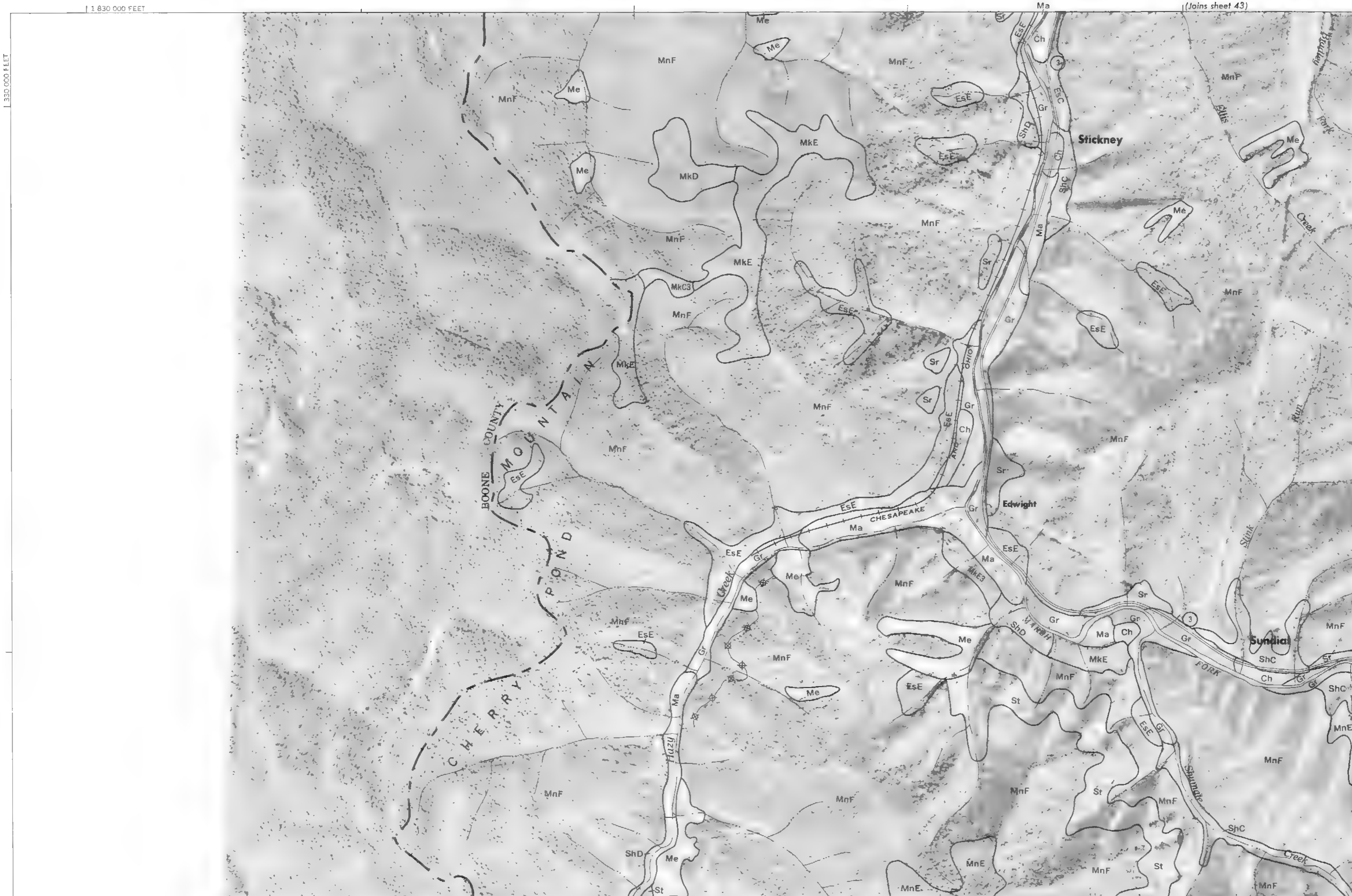

(Joins sheet 41)
(Joins sheet 50)
(Joins sheet 52)
(Joins sheet 61)
N
Scale 1:20000
1 Mile
5000 Feet
Danese
Bellwood
Glade Creek
Mill Creek
Smokey Branch
Sturgeon Br
Sewell Mountain
Old Schoolhouse Branch
Sewell Creek
345 000 FEET
2 050 000 FEET



Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 52



N

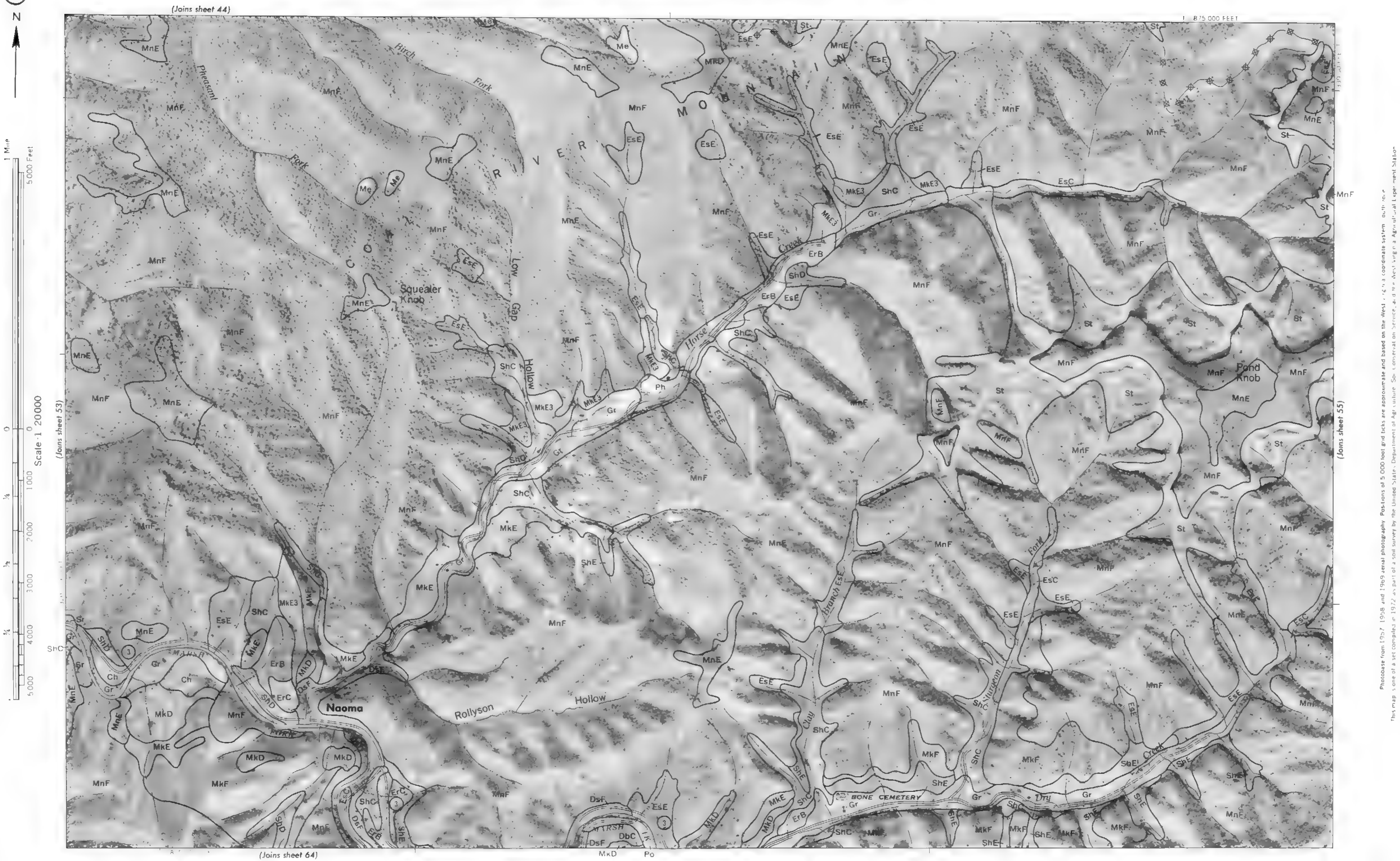
1 Mile ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0 5000 Feet

Scale 1:20000

FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 53

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.


54
N
(Joins sheet 44)
(Joins sheet 53)
(Joins sheet 55)
(Joins sheet 64)
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
1 875 000 FEET
COAL RIVER MOUNTAIN
Squealer Knob
Pond Knob
Naoma
Pheasant Fork
Birch Fork
Low Gap Hollow
Horse Creek
Rollyson Hollow
Clay Branch
Sturgeon Fork
Dry Creek
Marsh Fork
BONE CEMETERY
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

N

(Joins sheet 45)

(Joins sheet 54)

(Joins sheet 56)

(Joins sheet 65)

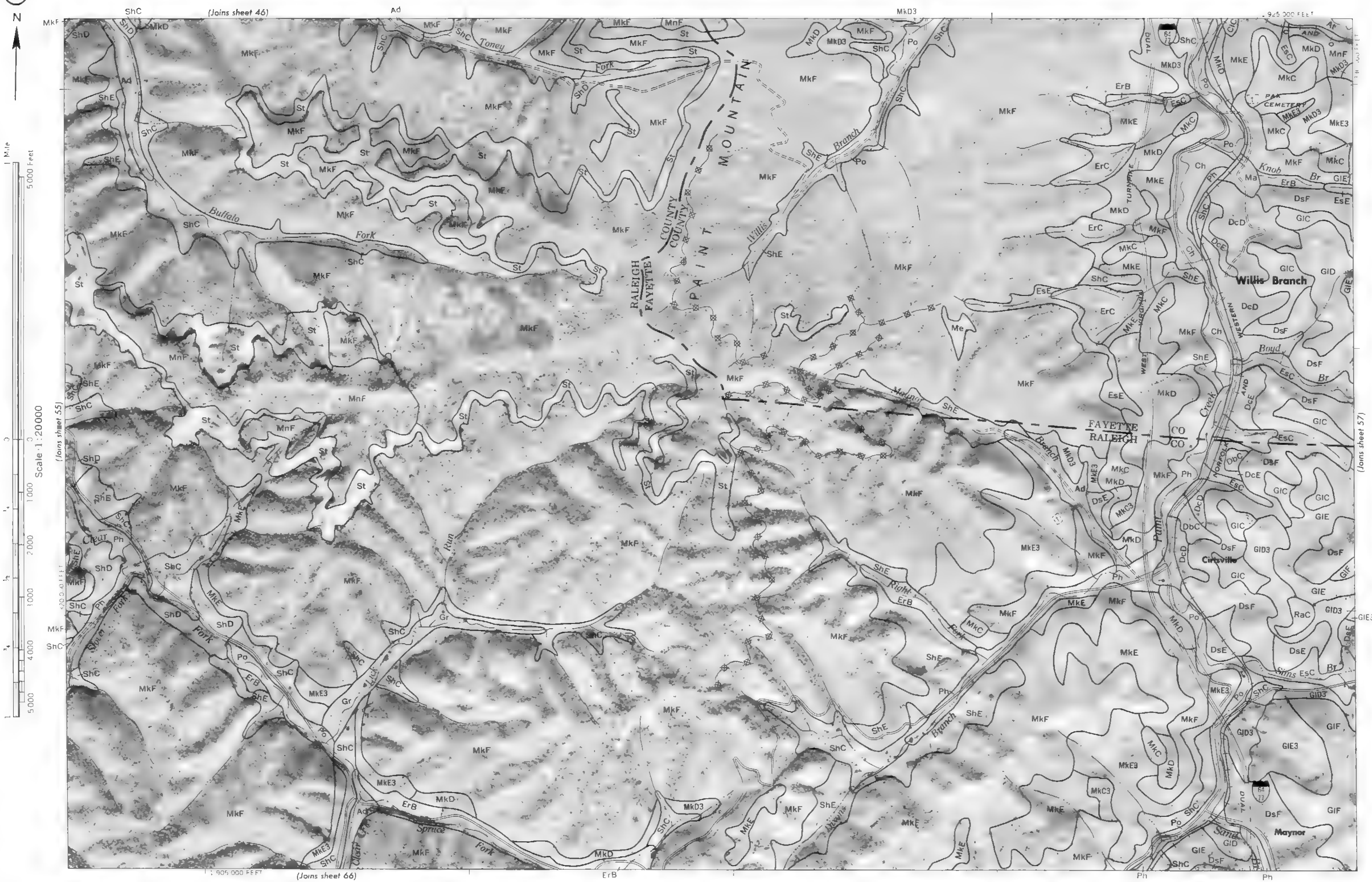
1 900 000 FEET

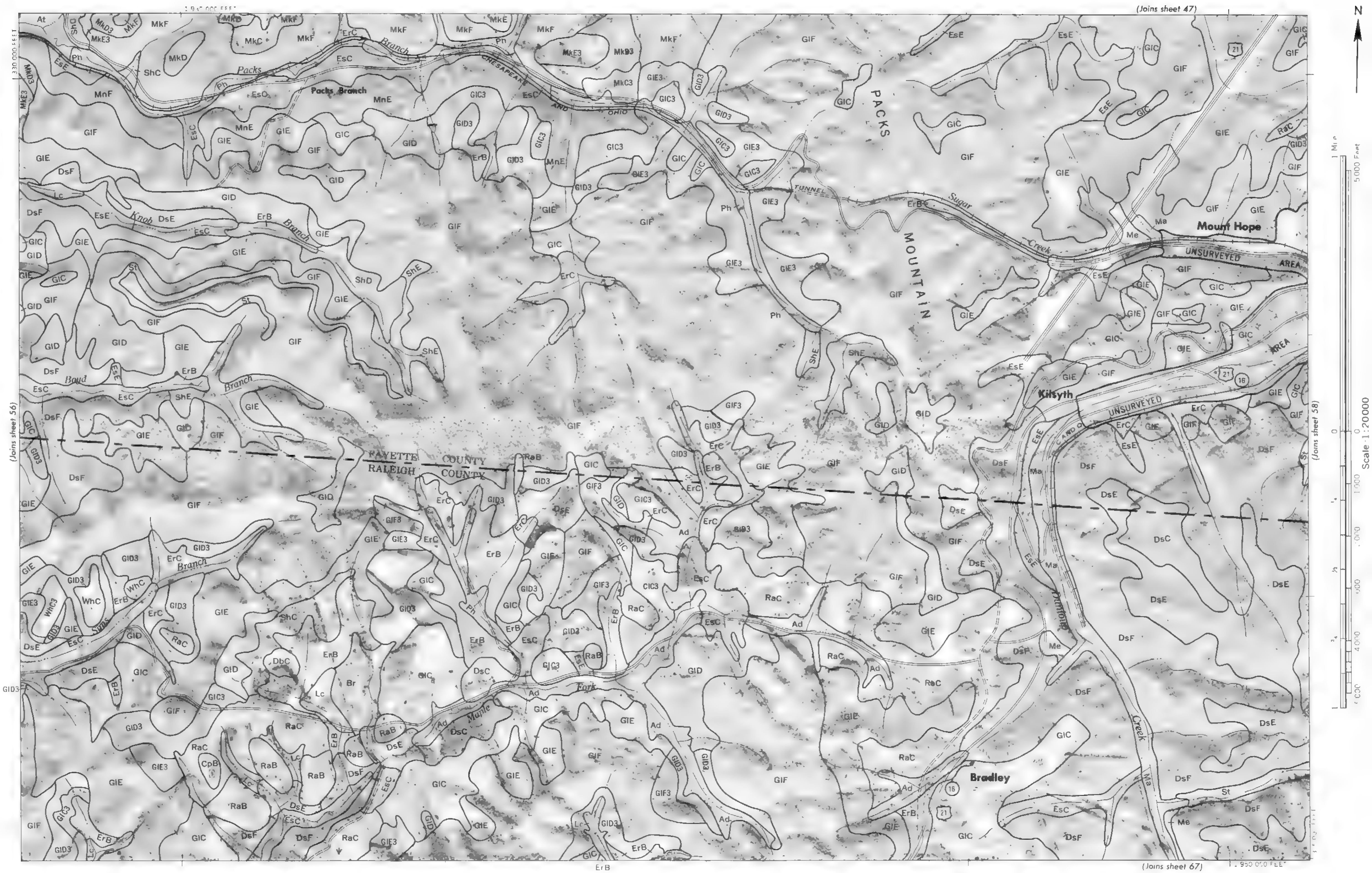
1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

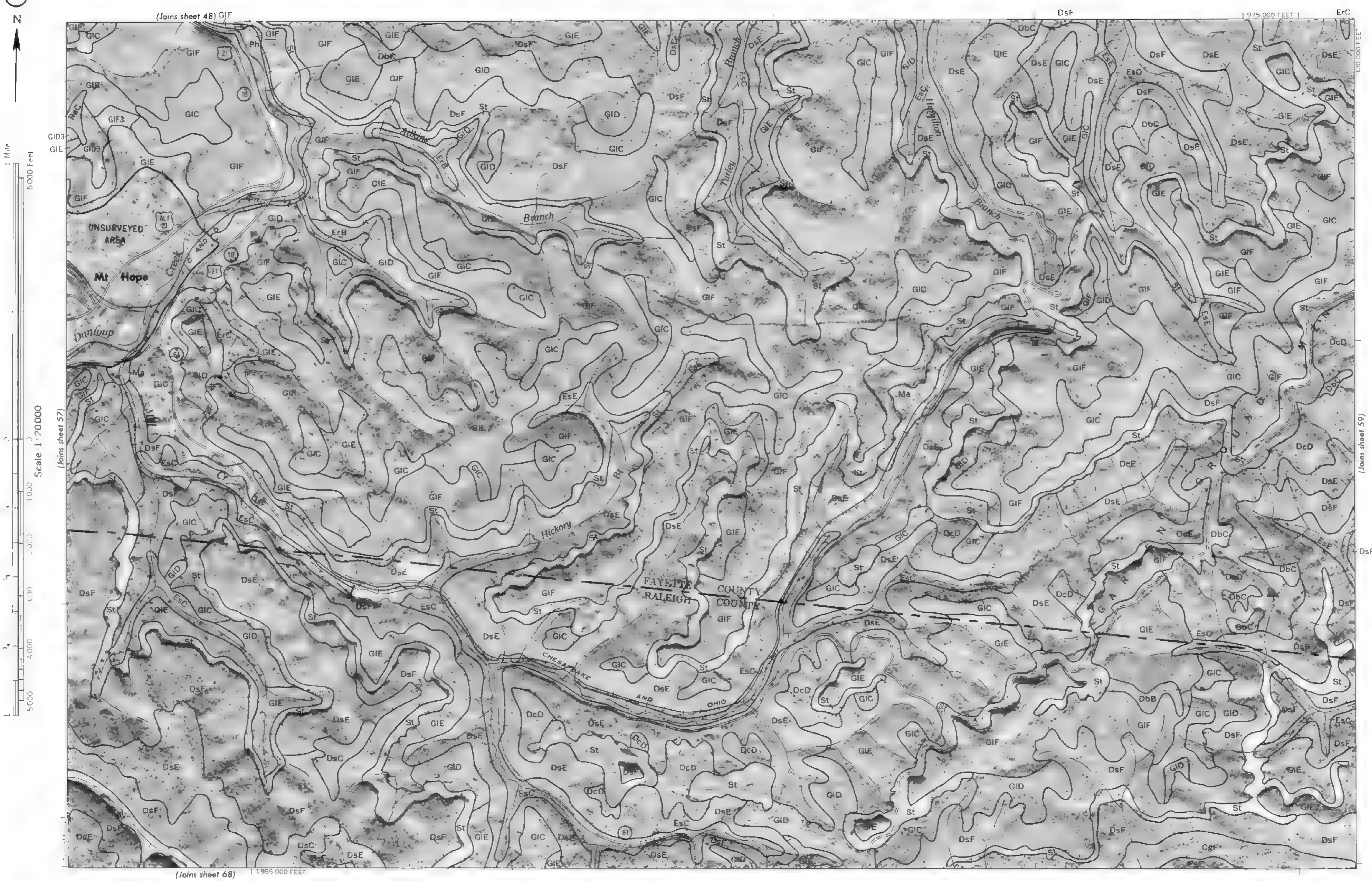
Scale 1:20000


56
N
(Joins sheet 46)
(Joins sheet 55)
(Joins sheet 57)
(Joins sheet 66)
Scale 1:20000
1 Mile
5000 Feet
925 000 FEET
905 000 FEET
PAINT MOUNTAIN
RALEIGH COUNTY
FAYETTE COUNTY
FAYETTE CO
RALEIGH CO
Willis Branch
Cirtsville
Maynor
PAX CEMETERY
WEST VIRGINIA TURNPIKE
NORFOLK AND WESTERN
Buffalo Fork
Toney Fork
Clear Fork
Spruce Fork
Paint Creek
Right Fork
Maynor Branch
Knob Br
Boyd Br
Sims Br
Willis Branch
Lick Run
DUAL 64 77

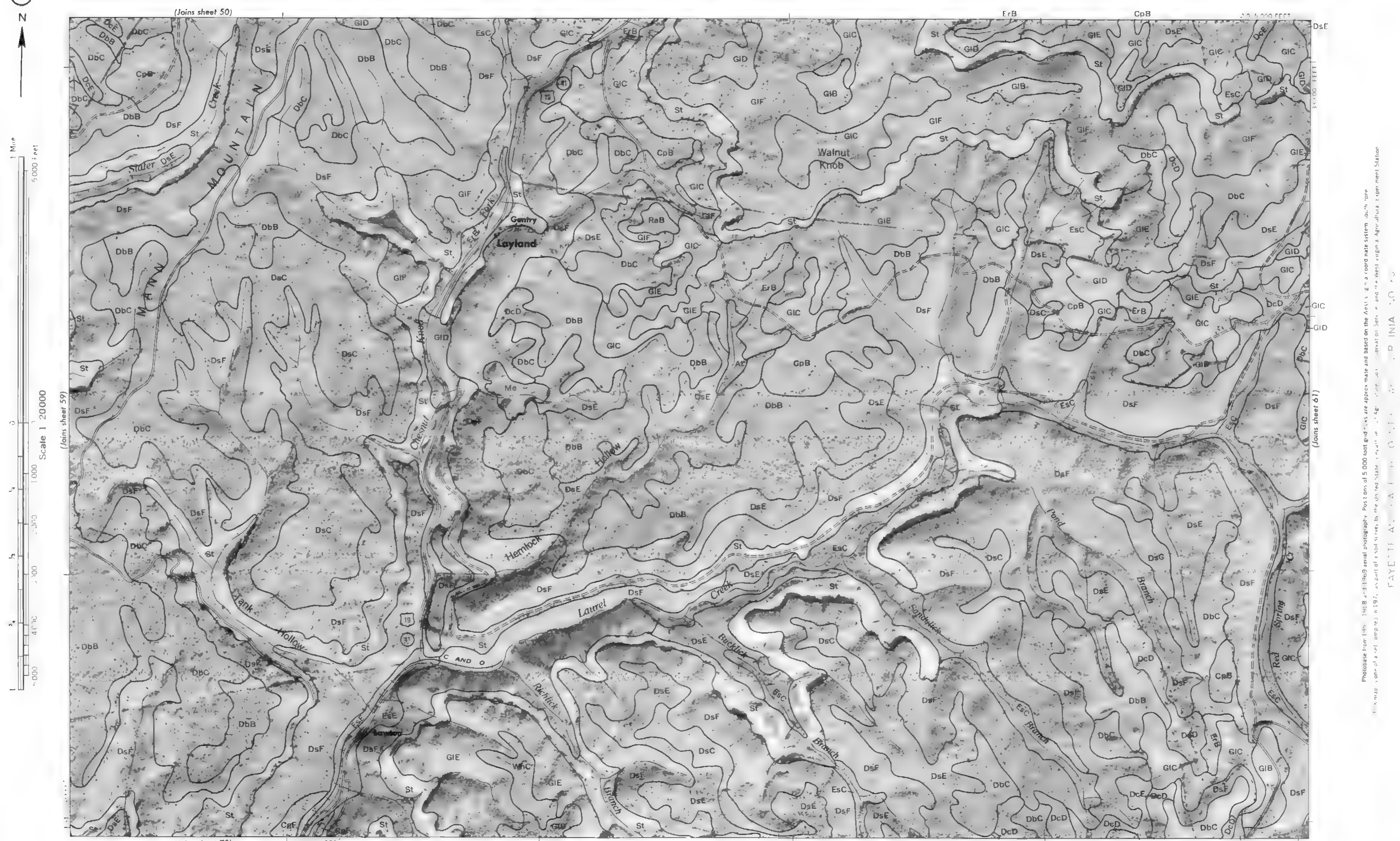

(Joins sheet 47)
(Joins sheet 56)
(Joins sheet 58)
(Joins sheet 67)
N
Scale 1:20000
1 Mile
5000 Feet
Packs Branch
Packs
Knob Branch
Boyd Branch
Sims Branch
Maple Fork
Sugar Creek
Dunloup Creek
PACKS MOUNTAIN
CHESAPEAKE AND OHIO
TUNNEL
Mount Hope
Kilsyth
Bradley
UNSURVEYED AREA
FAYETTE COUNTY
RALEIGH COUNTY
21
16

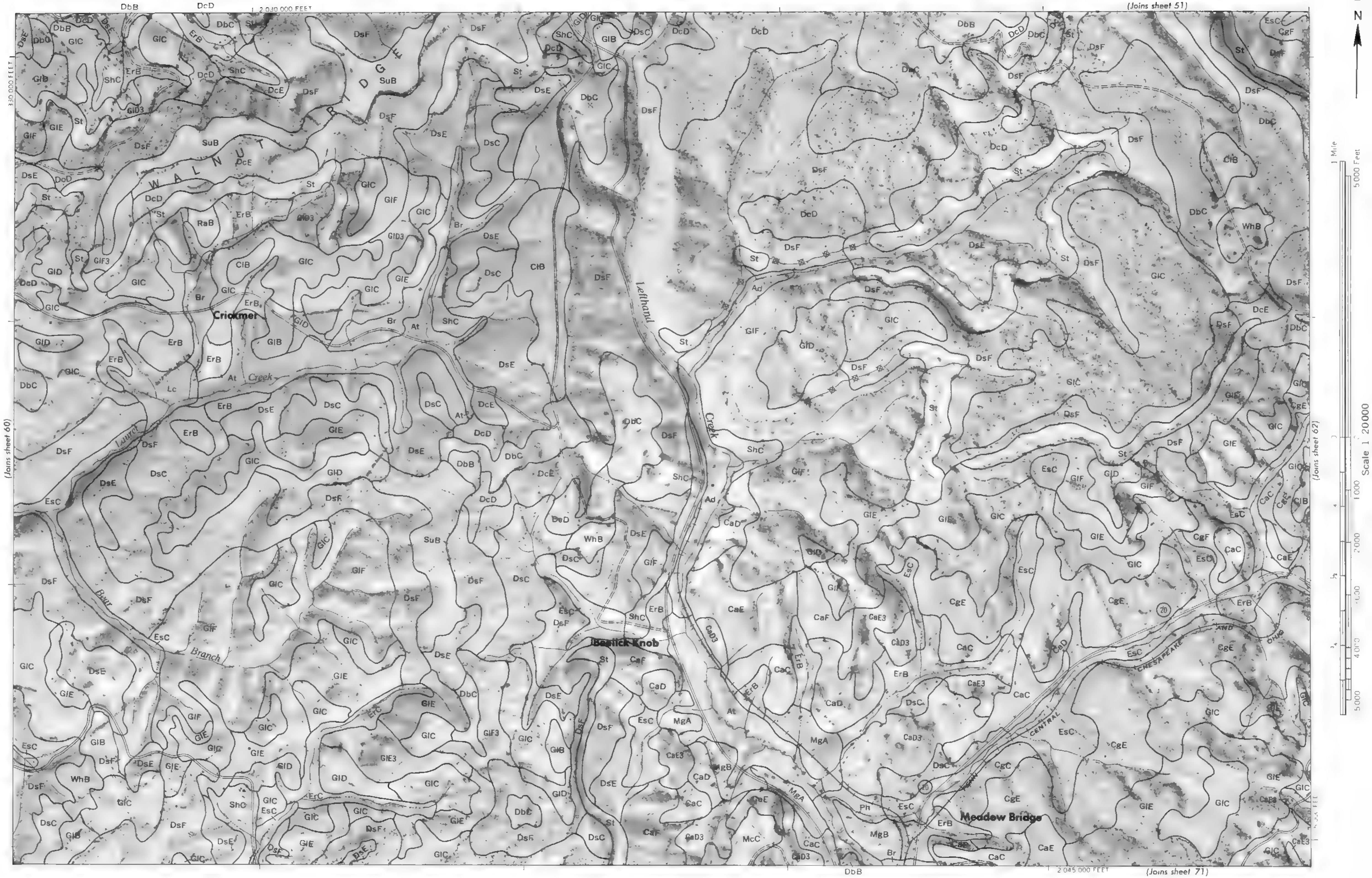
58

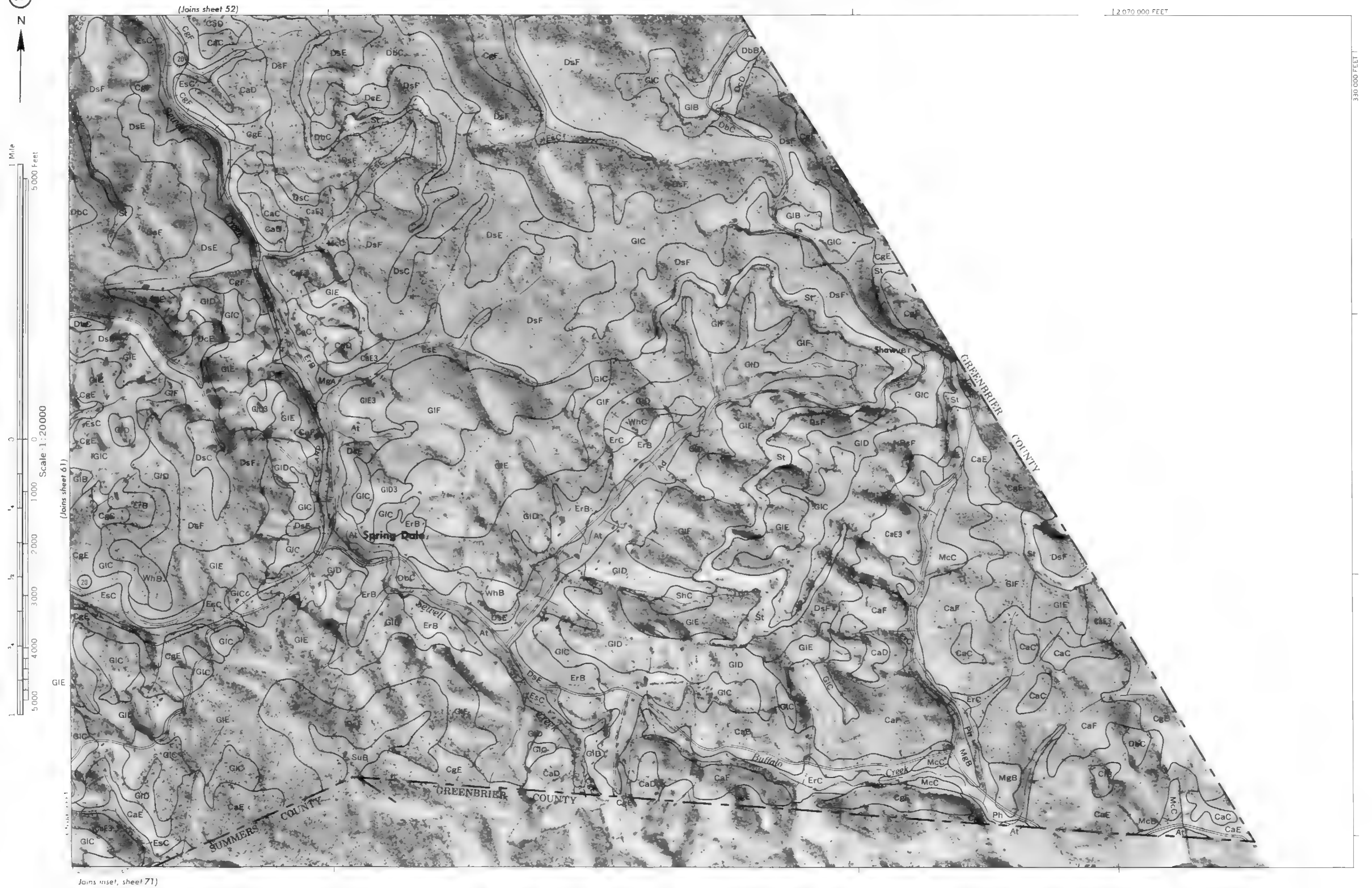
FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA — SHEET NUMBER 58




59
N
(Joins sheet 49)
(Joins sheet 58)
(Joins sheet 60)
(Joins sheet 69)
GARDEN GROUND MOUNTAIN
NEW RIVER
OHIO
CHESAPEAKE AND OHIO
Thayer
QUARRY
Slater Creek
Dowdy Creek
MANN MOUNTAIN
FAYETTE CO
RALEIGH CO
Scale 1:20000

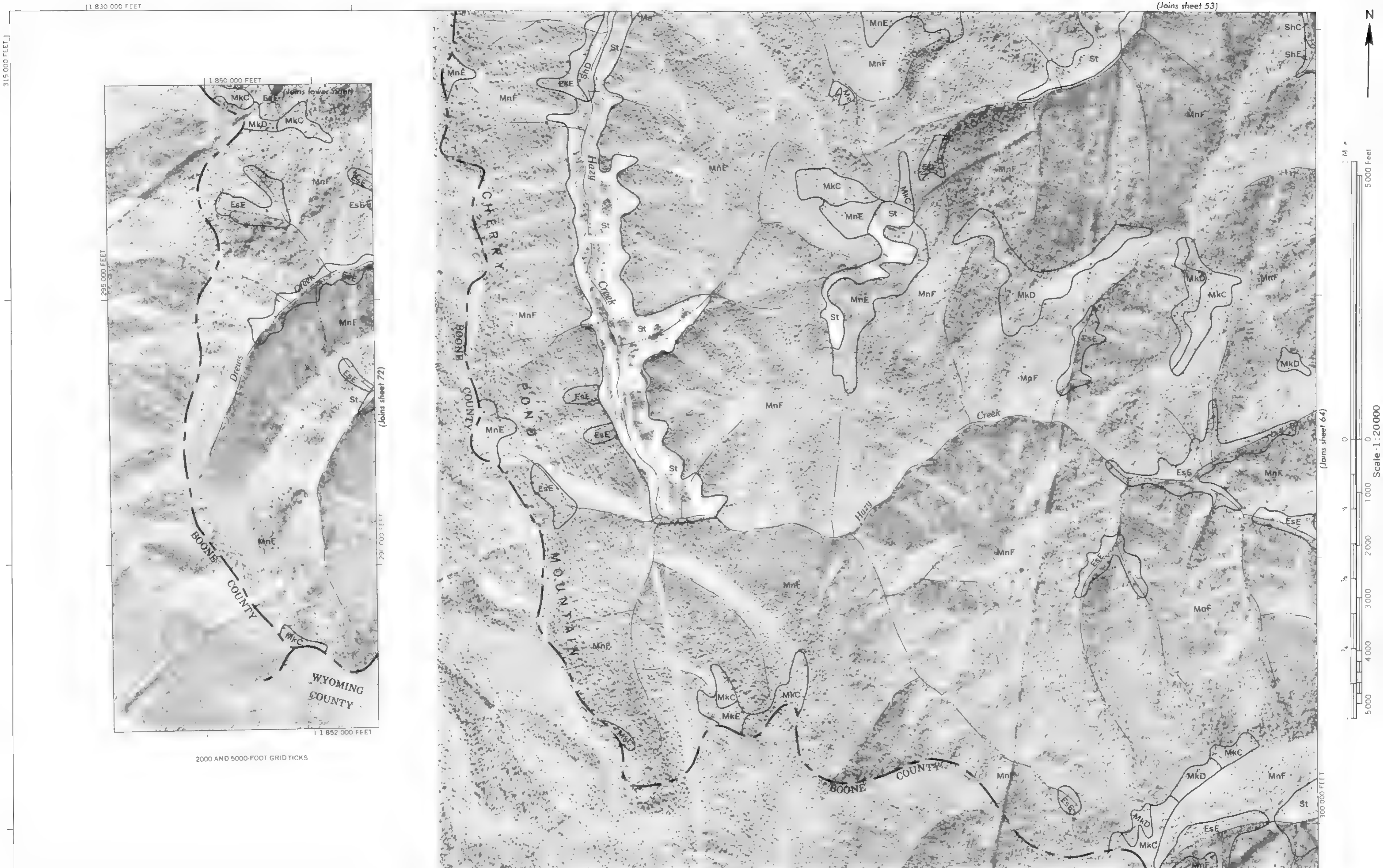

N
(Joins sheet 50)
(Joins sheet 59)
(Joins sheet 61)
(Joins sheet 70)
1 Mile
5000 Feet
Scale 1:20000
Walnut Knob
Layland
Gentry
MANN MOUNTAIN
Slater Creek
Chestnut Knob
Hemlock Hollow
Tank Hollow
Laurel Creek
Rucklick Branch
Richlick Branch
Pond Branch
Sandlick
Red Spring
C AND O
19
41


(Joins sheet 51)
(Joins sheet 60)
(Joins sheet 62)
(Joins sheet 71)
2 040 000 FEET
2 045 000 FEET
330 000 FEET
WALNUT RIDGE
Crickmer
Laurel Creek
Lefthand Creek
Bear Branch
Beelick Knob
Meadow Bridge
CHESAPEAKE AND OHIO
CENTRAL
N
1 Mile
5000 Feet
Scale 1:20000



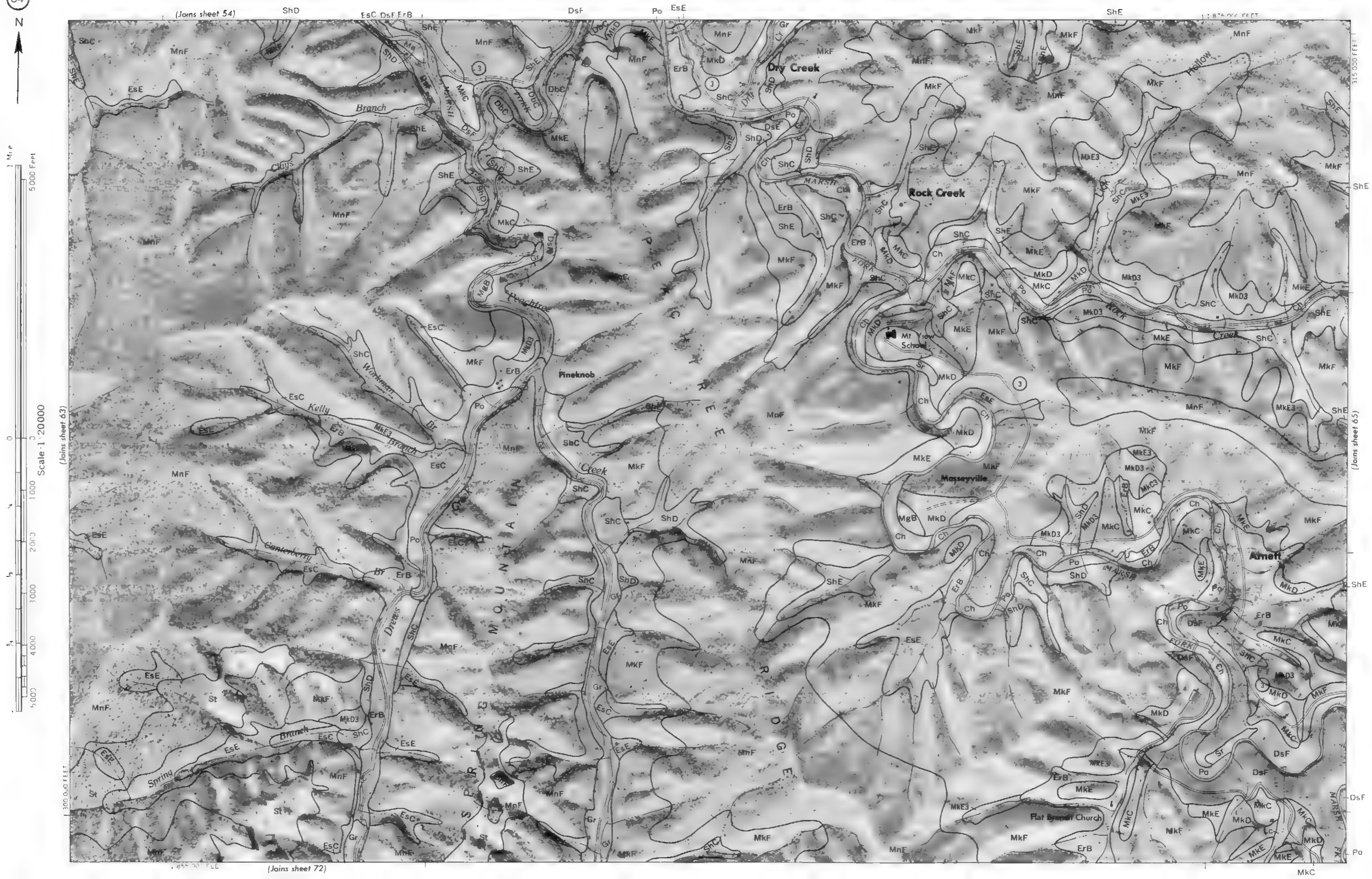
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

63



FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 63

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958, and 1959 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

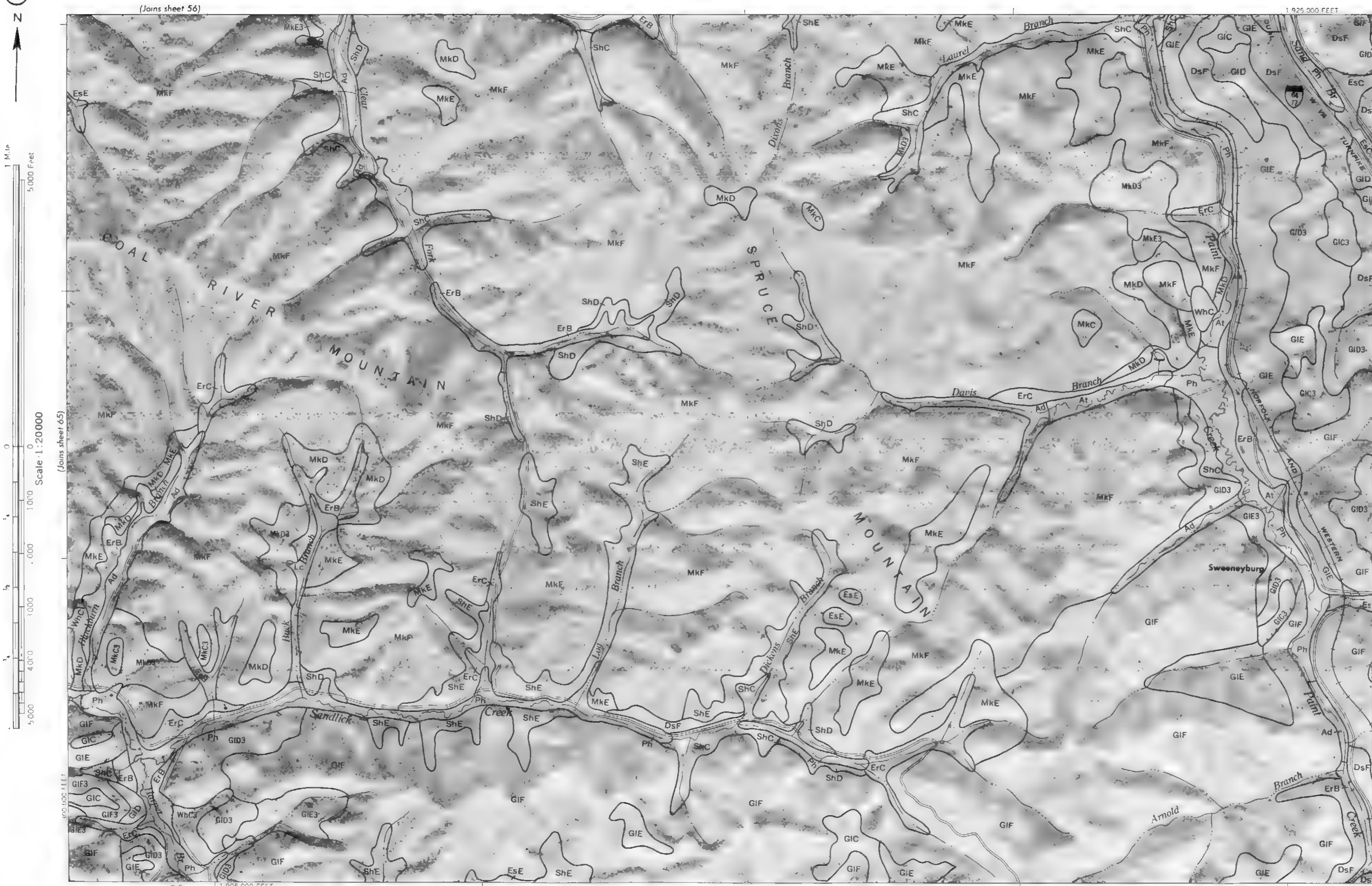


Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

This map is one of a set compiled in 197_ as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 64

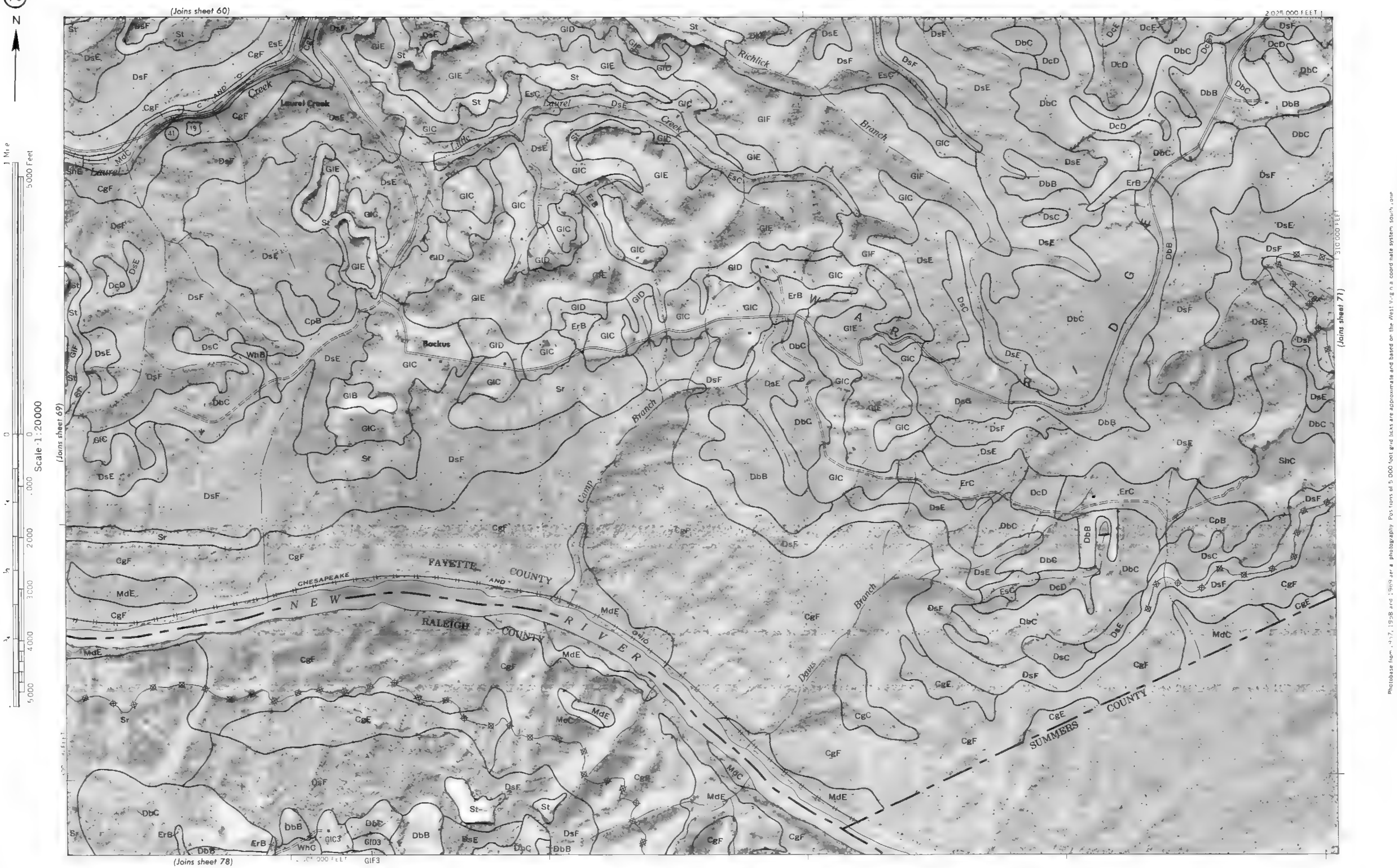

(Joins sheet 55)
(Joins sheet 64)
(Joins sheet 66)
(Joins sheet 73)
C O A L   R I V E R   M O U N T A I N
Righthand Fork
Rock Creek
Sandlick Creek
Long Branch
Lick Branch
Dameron
Right Fork
1 900 000 FEET
315 000 FEET
N
Scale 1:20000
1 Mile
5000 Feet

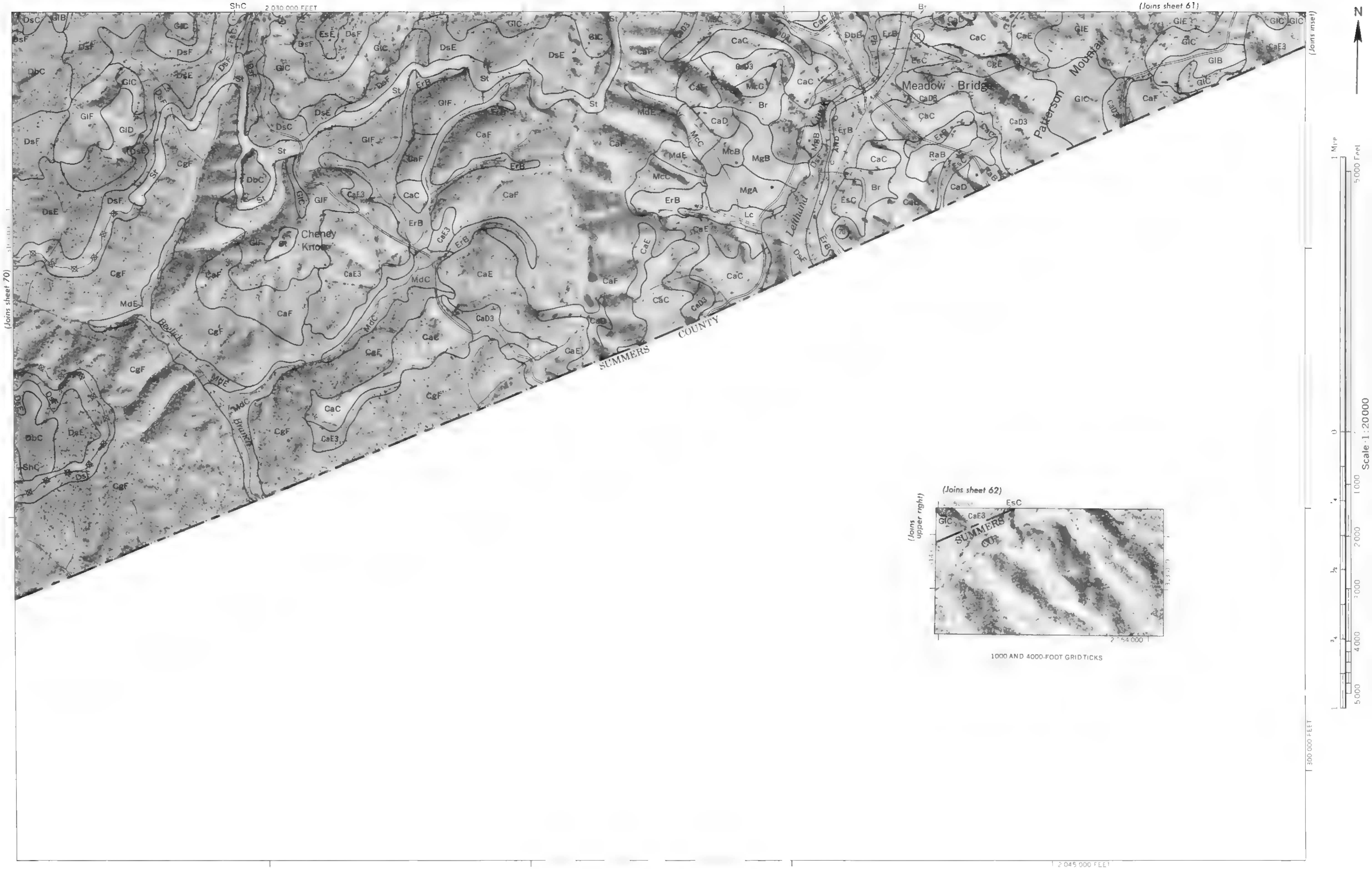

N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 56)
(Joins sheet 65)
(Joins sheet 67)
(Joins sheet 74)
1 925 000 FEET
1 905 000 FEET
315 000 FEET
COAL RIVER MOUNTAIN
SPRUCE MOUNTAIN
Sweeneyburg
Clear Fork
Laurel Branch
Dixons Branch
Davis Branch
Paint Creek
Sandlick Creek
Log Branch
Buck Branch
Dickens Branch
Blackburn Branch
Arnold Branch
TURNPIKE
NORFOLK AND WESTERN
MkF
MkE
MkD
MkC
ShC
ShD
ShE
ErB
ErC
Ad
At
Ph
GlF
GlE
GlD
GlC
GlD3
GlC3
DsF
EsE
EsC
WhC


1 930 000 FEET
(Joins sheet 57)
(Joins sheet 66)
(Joins sheet 68)
(Joins sheet 75)
1 950 000 FEET
N
Scale 1:20000
1 Mile
5000 Feet
Prosperity
Cranberry
North Sand Branch
South Sand Branch
Maple Fork
Dunloup Creek
Lefthand Fork
Cranberry Creek
W VA TURNPIKE


N
(Joins sheet 58)
(Joins sheet 67)
(Joins sheet 69)
(Joins sheet 76)
Scale 1:20000
1 Mile
5000 Feet
1 975 000 FEET
955 000 FEET
RALEIGH COUNTY
FAYETTE COUNTY
Stretcher Neck
NEW RIVER
McCreery
Piney View
Batoff Creek
BATOFF MOUNTAIN
Lanark
Stanaford
Stanaford Branch
Piney Creek
CHESAPEAKE AND OHIO

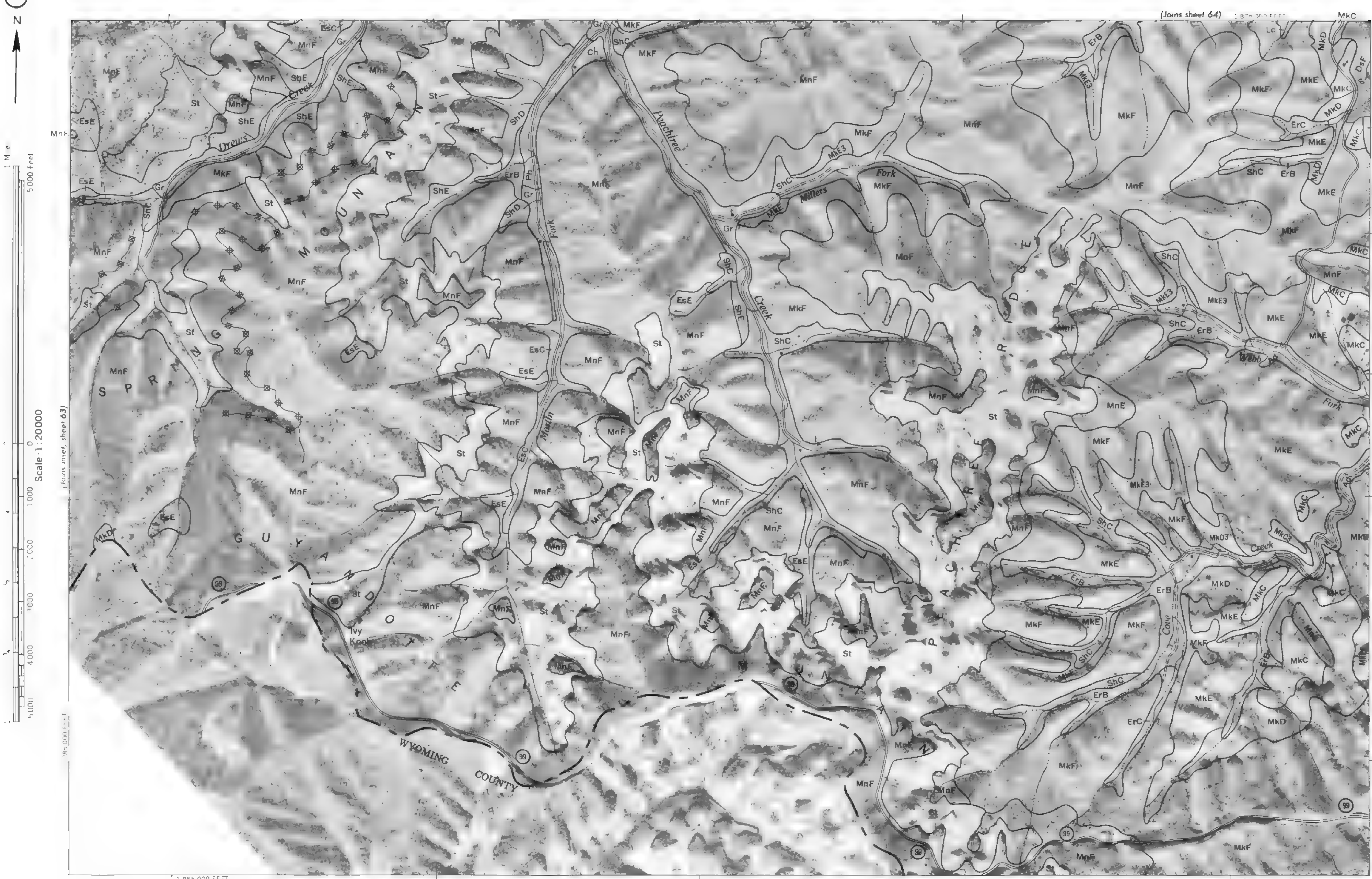
This map is one of a set compiled in 197_ as part of a soil survey by the United States Department of Agriculture ... and the West Virginia Agricultural Experiment Station.
Photobase from 195_ and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.


70
N
(Joins sheet 60)
(Joins sheet 69)
(Joins sheet 71)
(Joins sheet 78)
Scale 1:20 000
1 Mile
5000 Feet
Laurel Creek
Little Laurel Creek
Richlick Branch
Backus
Camp Branch
Davis Branch
W A R D
FAYETTE COUNTY
RALEIGH COUNTY
SUMMERS COUNTY
NEW RIVER
CHESAPEAKE AND OHIO



FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 71

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station. Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.


72
N
(Joins sheet 64)
(Joins sheet 73)
(Joins inset, sheet 92)
(Joins inset, sheet 63)
Scale 1:20000
1 Mile
5000 Feet
1 855 000 FEET
SPRING MOUNTAIN
GUYANDOTTE
PEACH TREE RIDGE
WYOMING COUNTY
Ivy Knob
Drews Creek
Peachtree Creek
Millers Fork
Marsh Fork
Webb Fork
Cove Creek


73
N
(Joins sheet 65)
(Joins sheet 72)
(Joins sheet 74)
(Joins sheet 79)
Shiloh
Stover
Fairdale
Trap Hill
Marsh
Fork
Cove
Branch
Spanker
Claypool
Hollow
Breckinridge
Creek
Dingess
Scale 1:20000

74

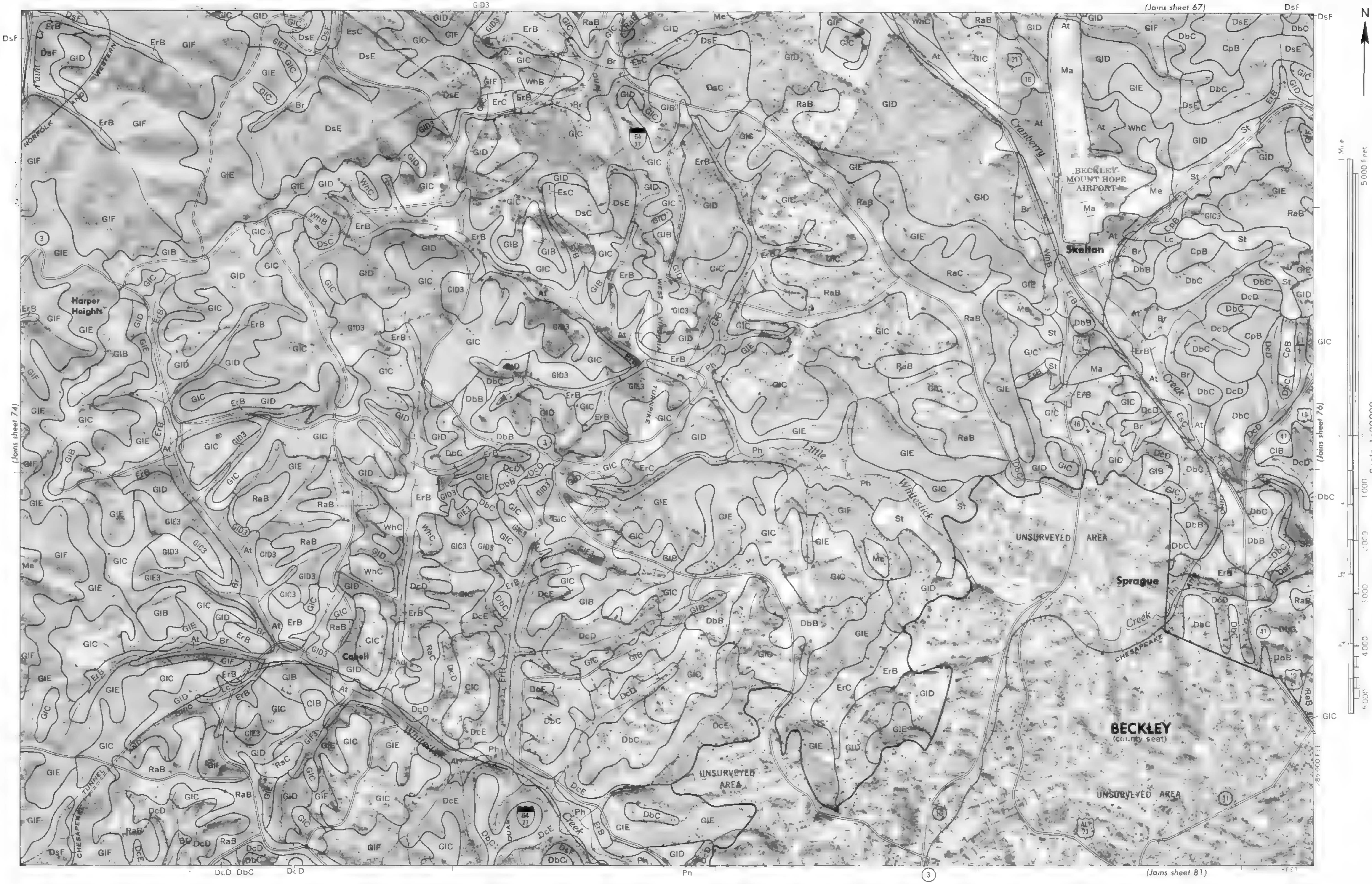
N

1 Mile

5000 Feet

Scale 1:20000

0 1000 2000 3000 4000 5000


(Joins sheet 67)
(Joins sheet 74)
(Joins sheet 76)
(Joins sheet 81)
N
Scale 1:20000
Harper Heights
Cabell
Skelton
Sprague
BECKLEY
(county seat)
BECKLEY-MOUNT HOPE AIRPORT
UNSURVEYED AREA
Cranberry
Creek
Little
Whitestick
WEST VIRGINIA TURNPIKE
NORFOLK AND WESTERN
CHESAPEAKE
TUNNEL

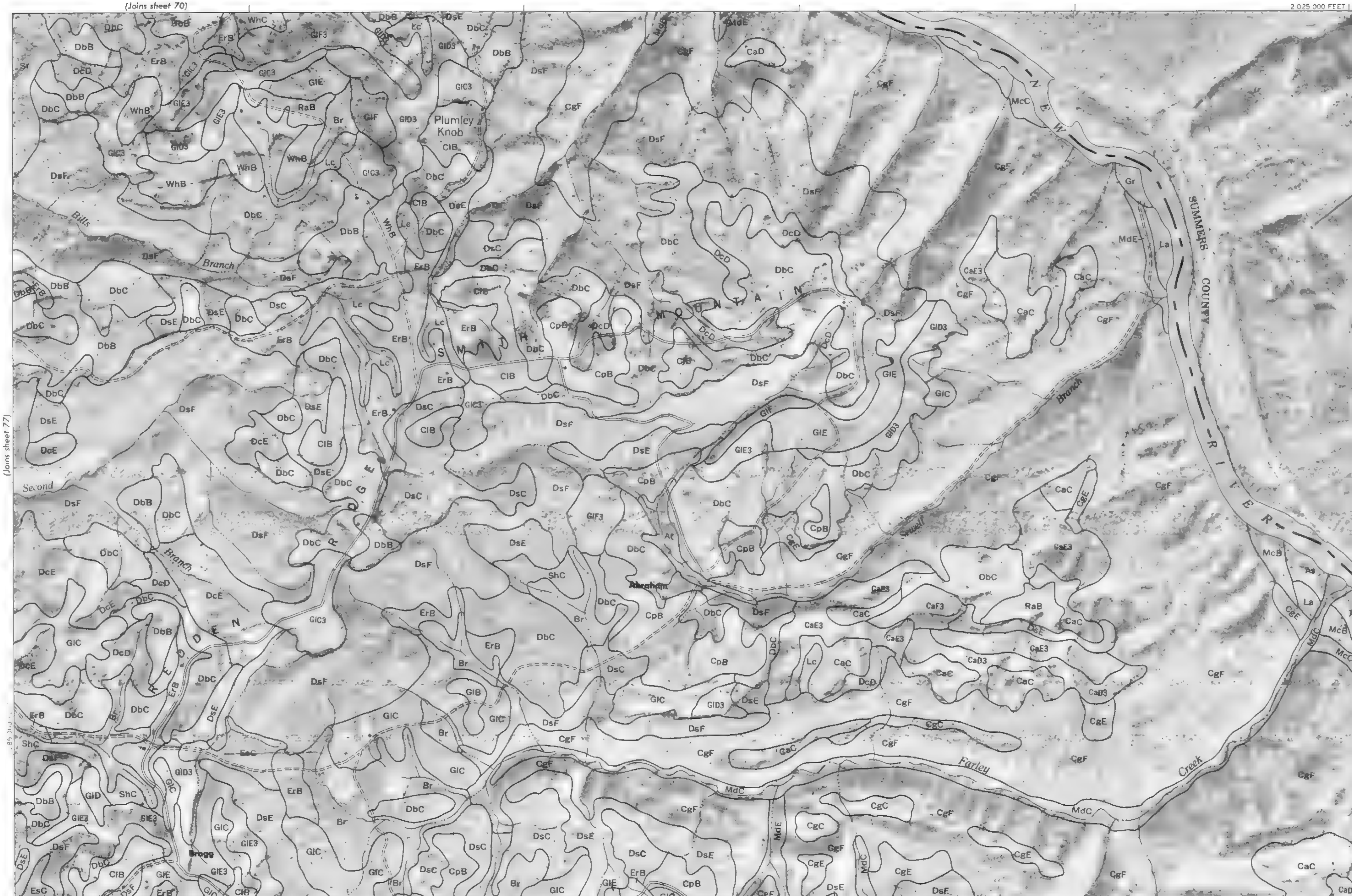

76
N
Scale 1:20000
(Joins sheet 68)
(Joins sheet 75)
(Joins sheet 77)
(Joins sheet 82)
Worden
Griffith
Branch
Piney Creek
Fat Creek
Cranberry Creek
CHESAPEAKE AND OHIO
UNSURVEYED AREA
RALEIGH COUNTY AIRPORT
BECKLEY
(county seat)


(Joins sheet 69)
(Joins sheet 76)
(Joins sheet 78)
(Joins sheet 83)
N
Scale 1:20000
1 Mile
5000 Feet
Mill Creek
Glade Creek
Bills Branch
Second Branch
Polls Branch
Fat Creek
Kates Br
Table Rock
DbC
DsF
DsE
DbB
DcD
ClB
GlC
GlE
ErB
Sr
St
EsC
DcE
ShC
RnB
SbD
Ao

N

(Joins sheet 70)

(Joins sheet 77)



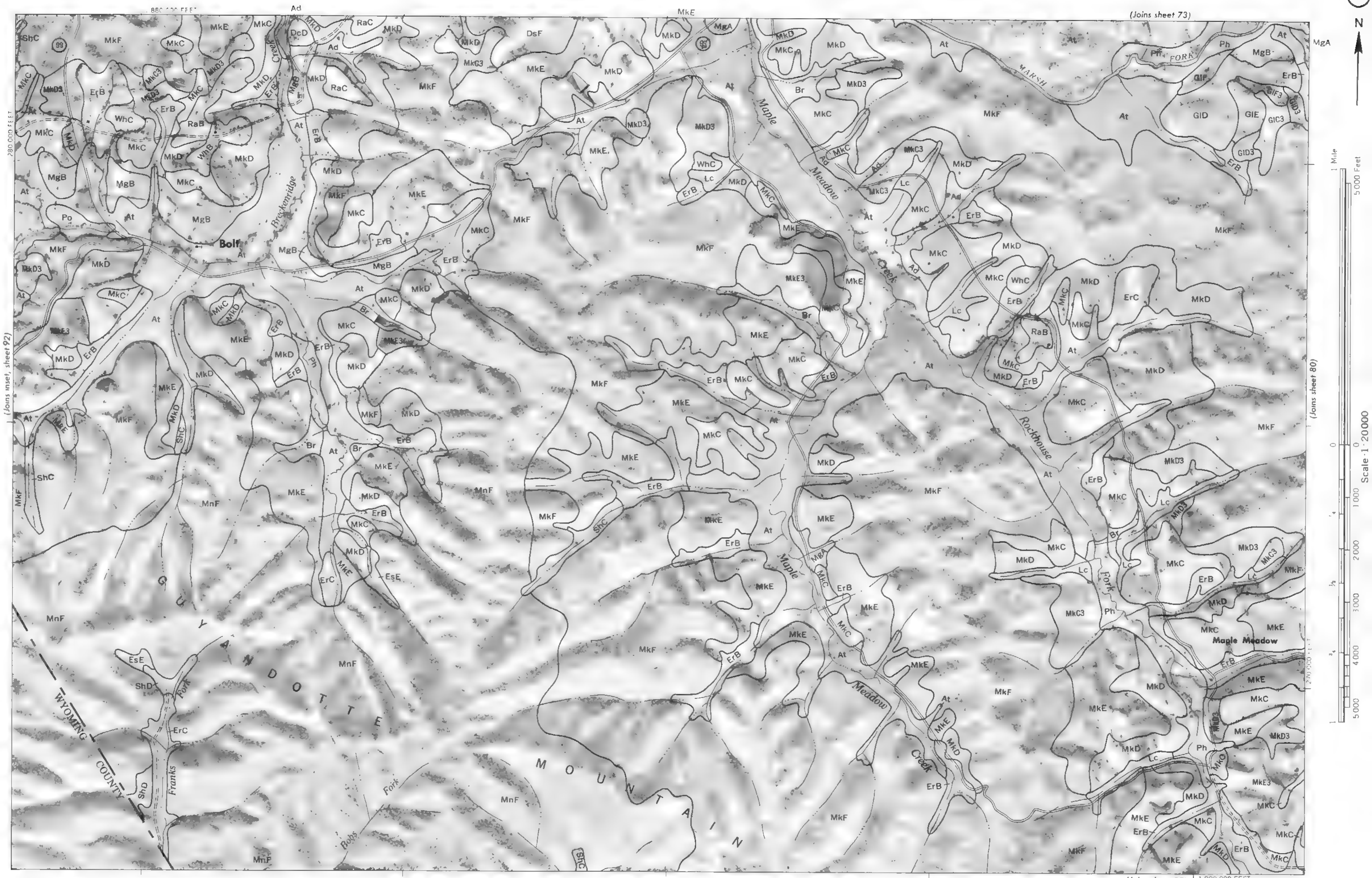
(Joins inset II, sheet 97)

(Joins sheet 84)

Scale 1:20000

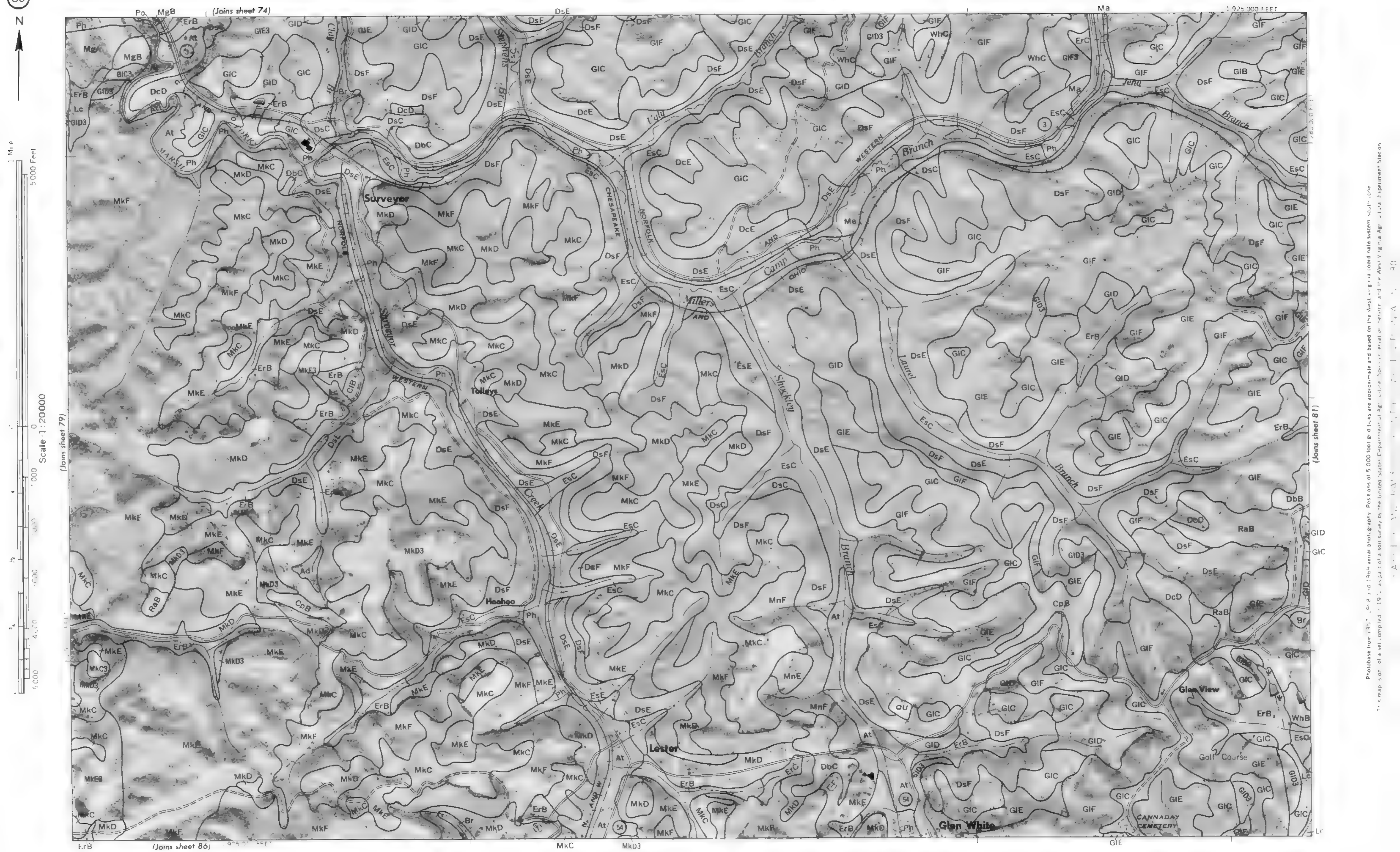
1 Mile

5000 Feet

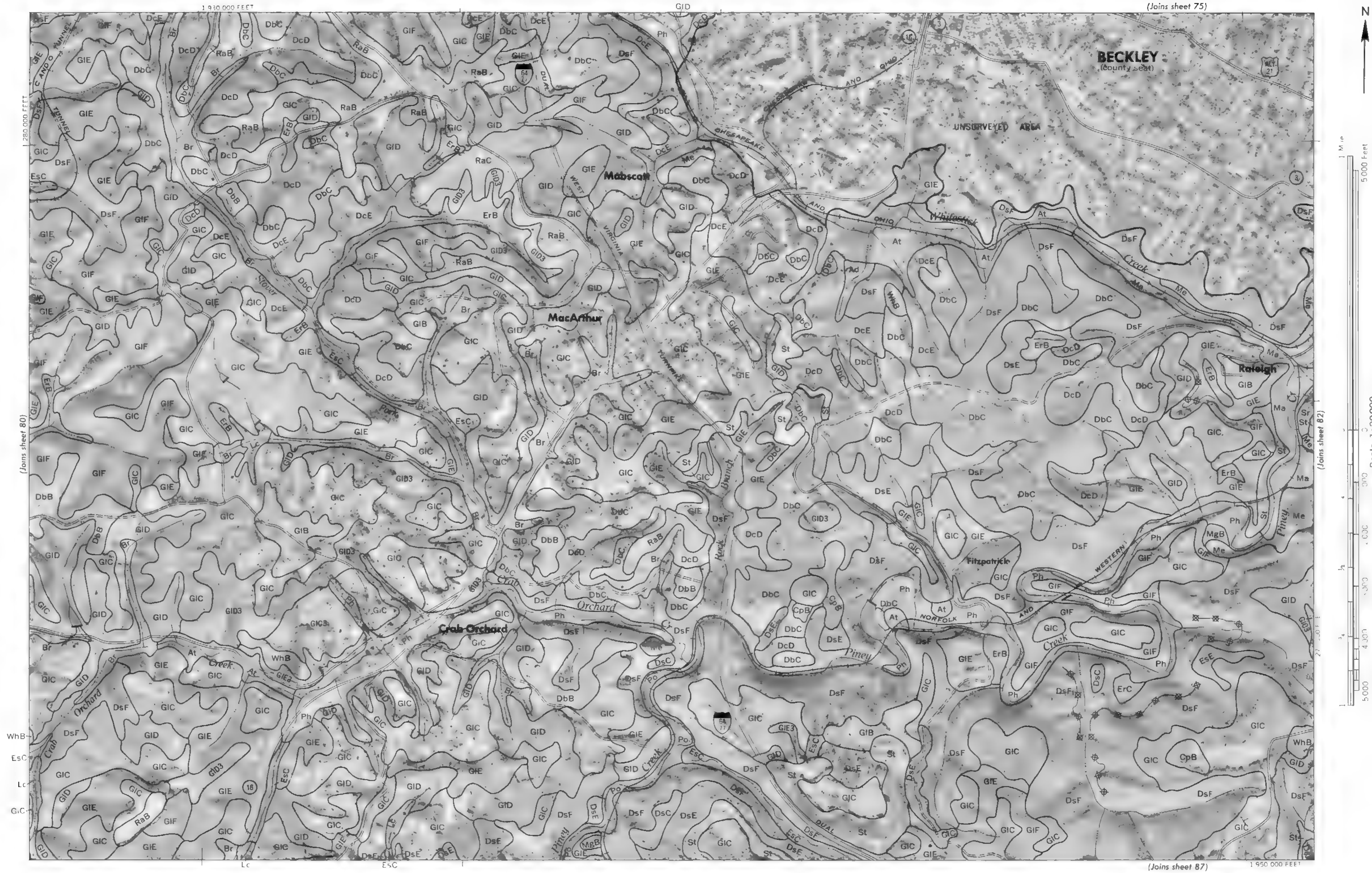


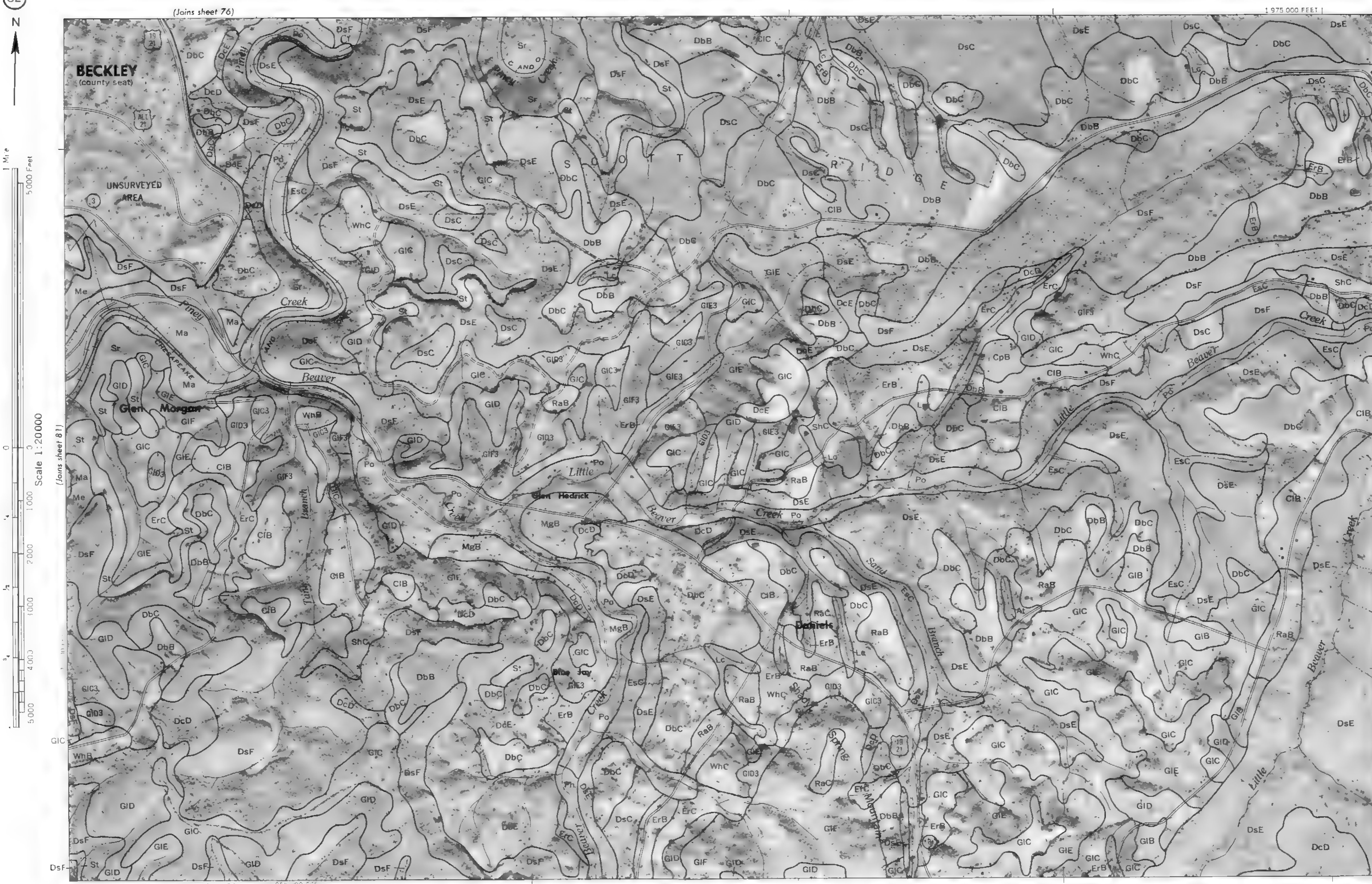
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

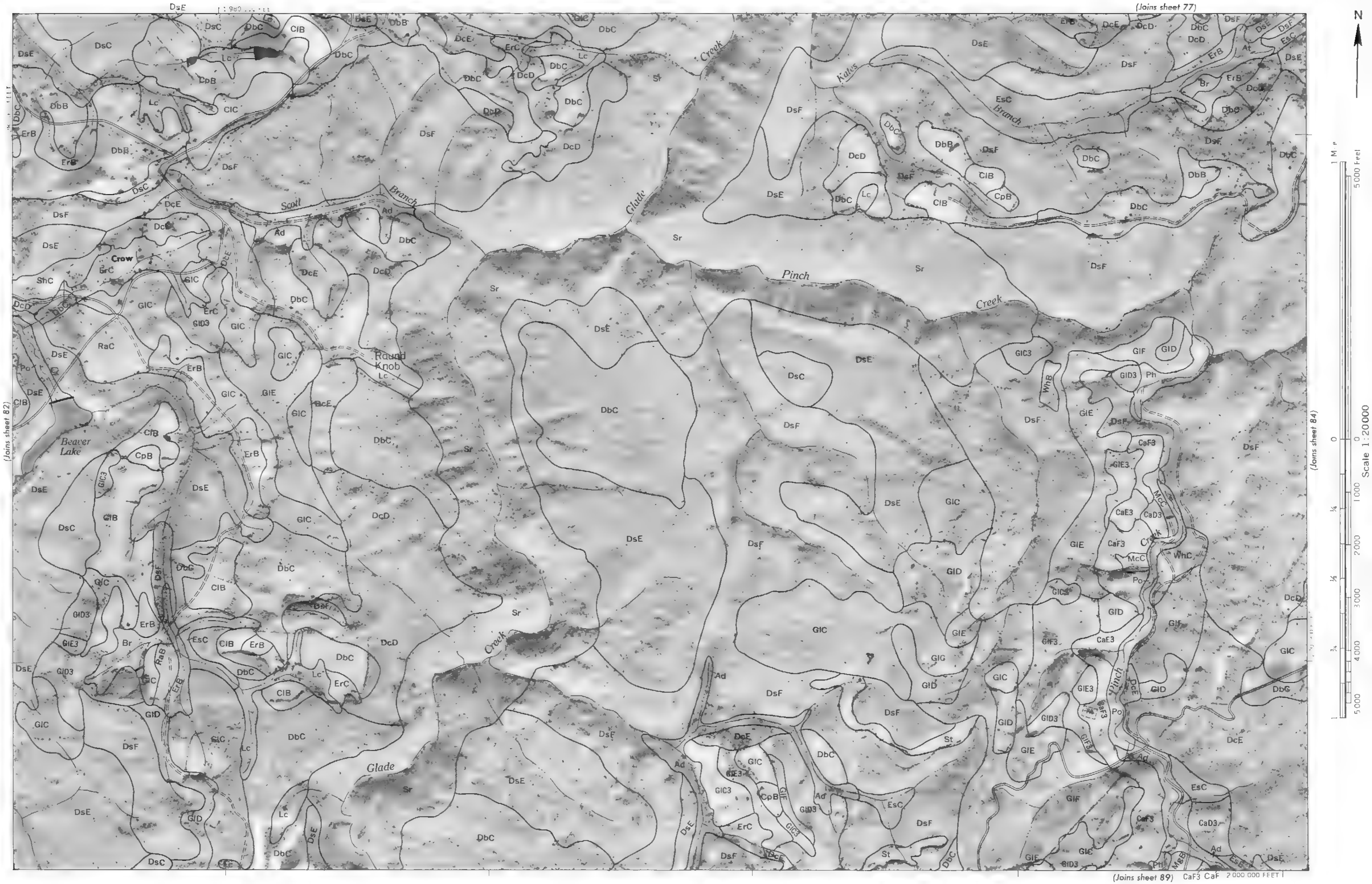
FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 79


80
N
(Joins sheet 74)
(Joins sheet 79)
(Joins sheet 81)
(Joins sheet 86)
1 Mile
5000 Feet
Scale 1:20000
1 925 000 FEET
Surveyor
Tolleys
Hoohoo
Lester
Glen White
Glen View
Millers Camp Branch
Laurel Branch
Shockley Branch
Ugly Branch
Jehu Branch
Stephens Br
Clay Br
Shreator Creek
CHESAPEAKE AND OHIO
NORFOLK AND WESTERN
Golf Course
CANNADAY CEMETERY
Photobase from 1957 and 1964 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.
This map is one of a set compiled in 197_ as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

81

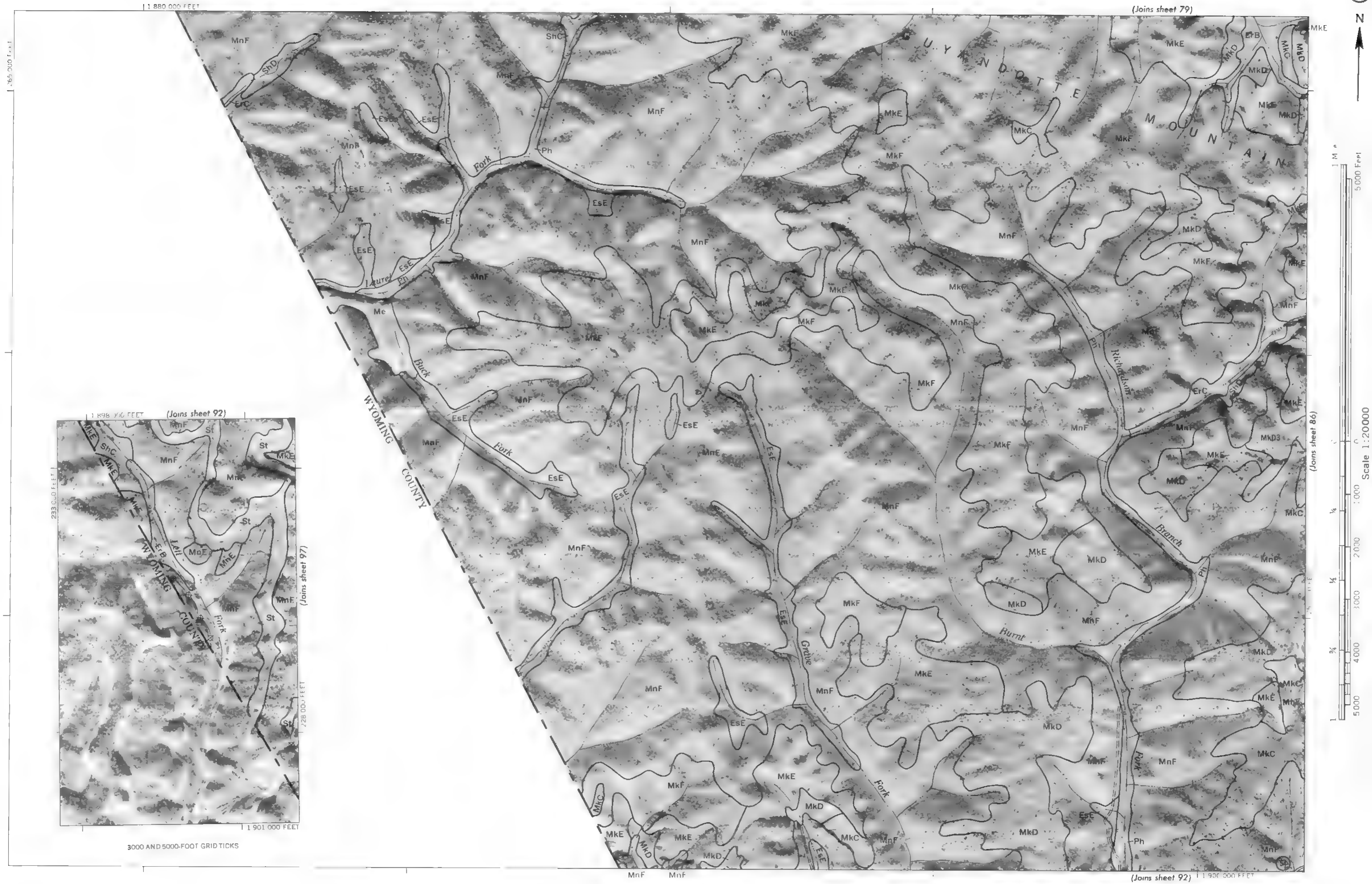

(Joins sheet 75)
(Joins sheet 80)
(Joins sheet 82)
(Joins sheet 87)
1 930 000 FEET
1 950 000 FEET
280 000 FEET
BECKLEY
(county seat)
UNSURVEYED AREA
Mabscott
MacArthur
Crab Orchard
Fitzpatrick
Raleigh
Whitestick Creek
Piney Creek
Crab Orchard Cr
Rock Branch
CHESAPEAKE AND OHIO
NORFOLK AND WESTERN
N
Scale 1:20000
1 Mile
5000 Feet

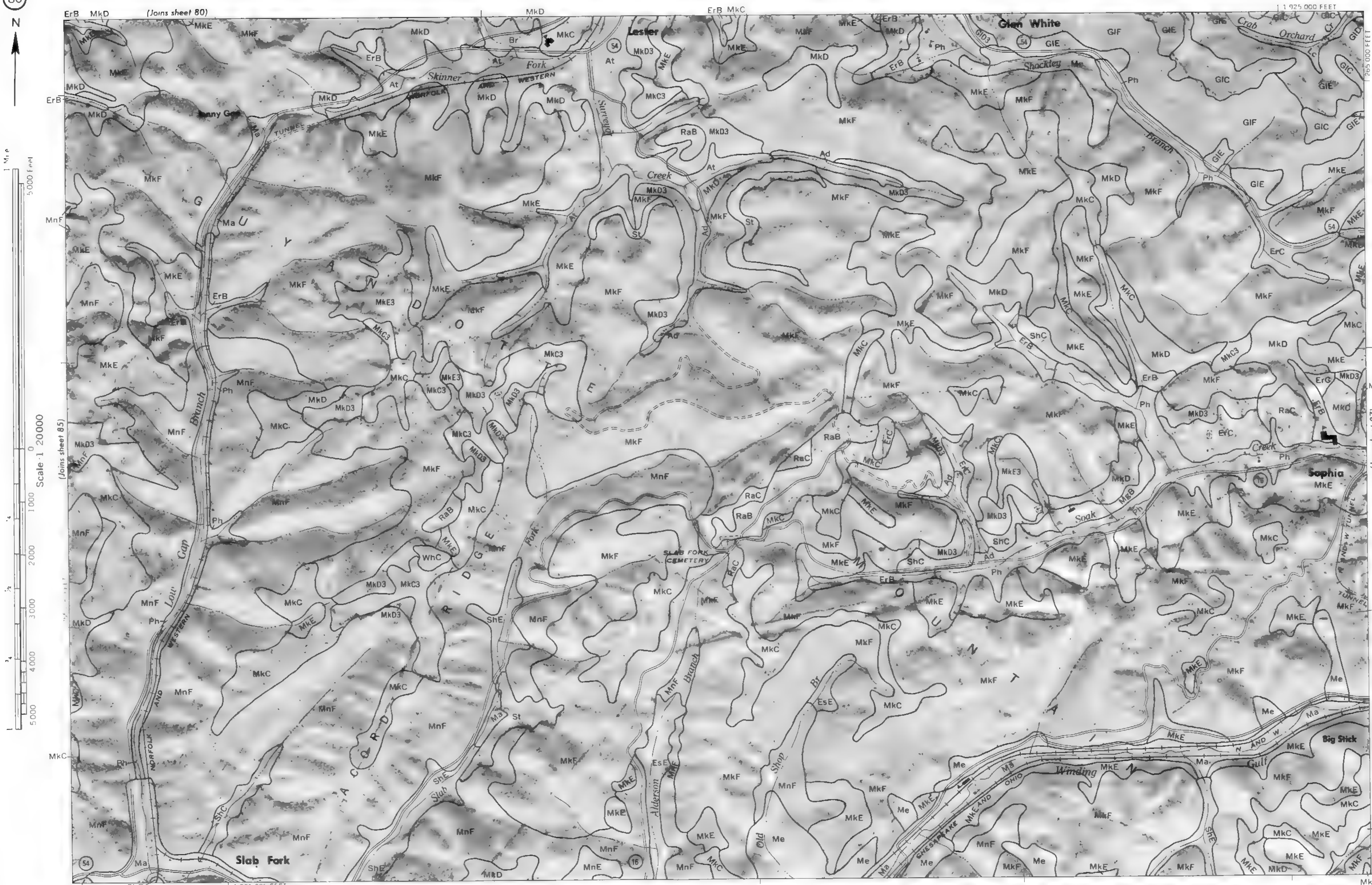

82
N
(Joins sheet 76)
(Joins sheet 81)
(Joins sheet 83)
(Joins sheet 88)
1 975 000 FEET
BECKLEY
(county seat)
UNSURVEYED AREA
Glen Morgan
Glen Hedrick
Daniels
Blue Jay
S C O T T R I D G E
Piney Creek
Beaver Creek
Little Beaver Creek
Sand Branch
Spring Branch
Scale 1:20000
1 Mile
5000 Feet


(Joins sheet 77)
(Joins sheet 82)
(Joins sheet 84)
(Joins sheet 89)
N
Scale 1:20000
5000 Feet
1 Mile
Scott Branch
Crow
Round Knob
Beaver Lake
Glade Creek
Pinch Creek
Kates Branch
Creek
Sr
DsE
DsF
DbC
GlC
DcD
2 000 000 FEET

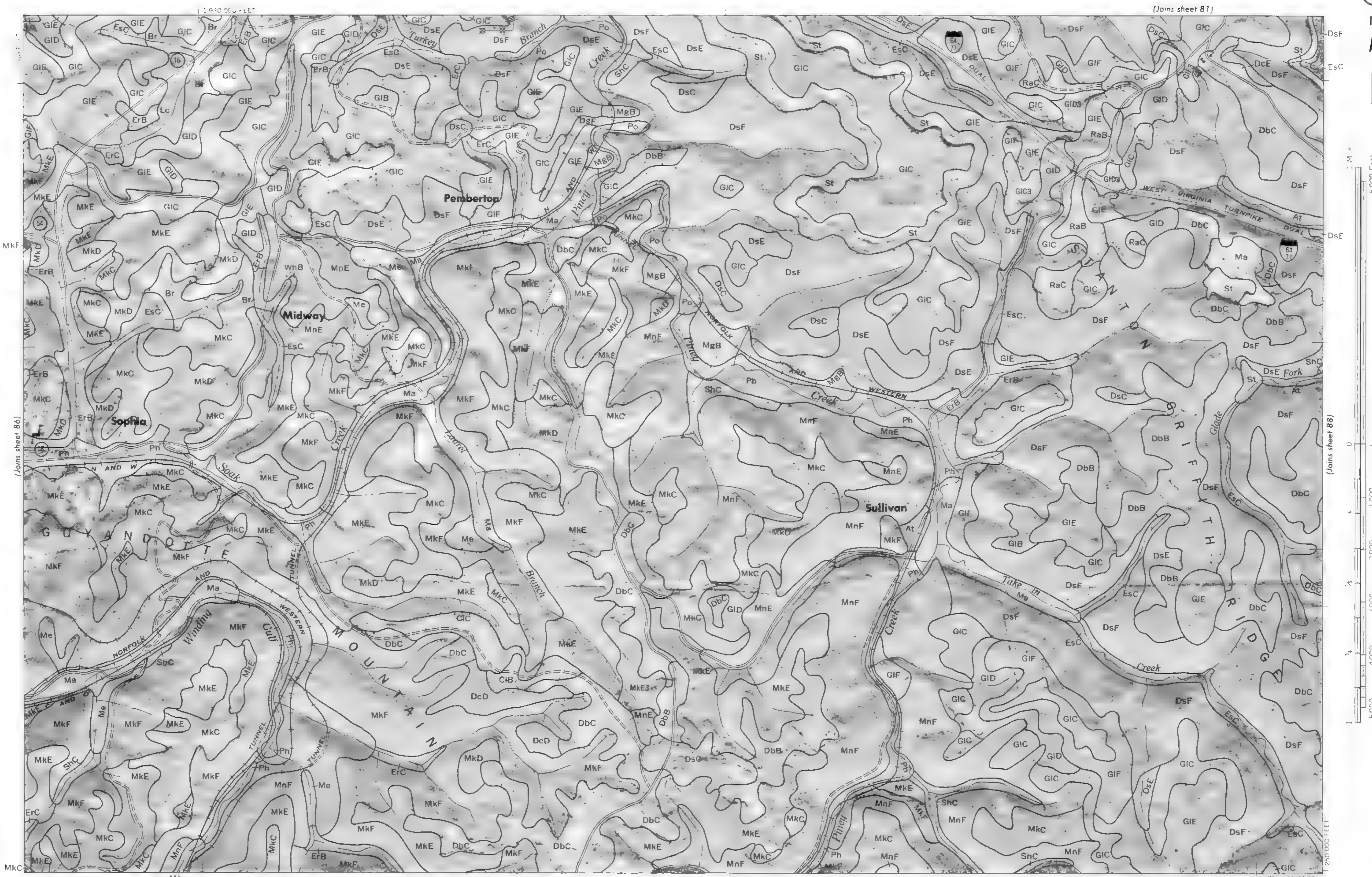
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

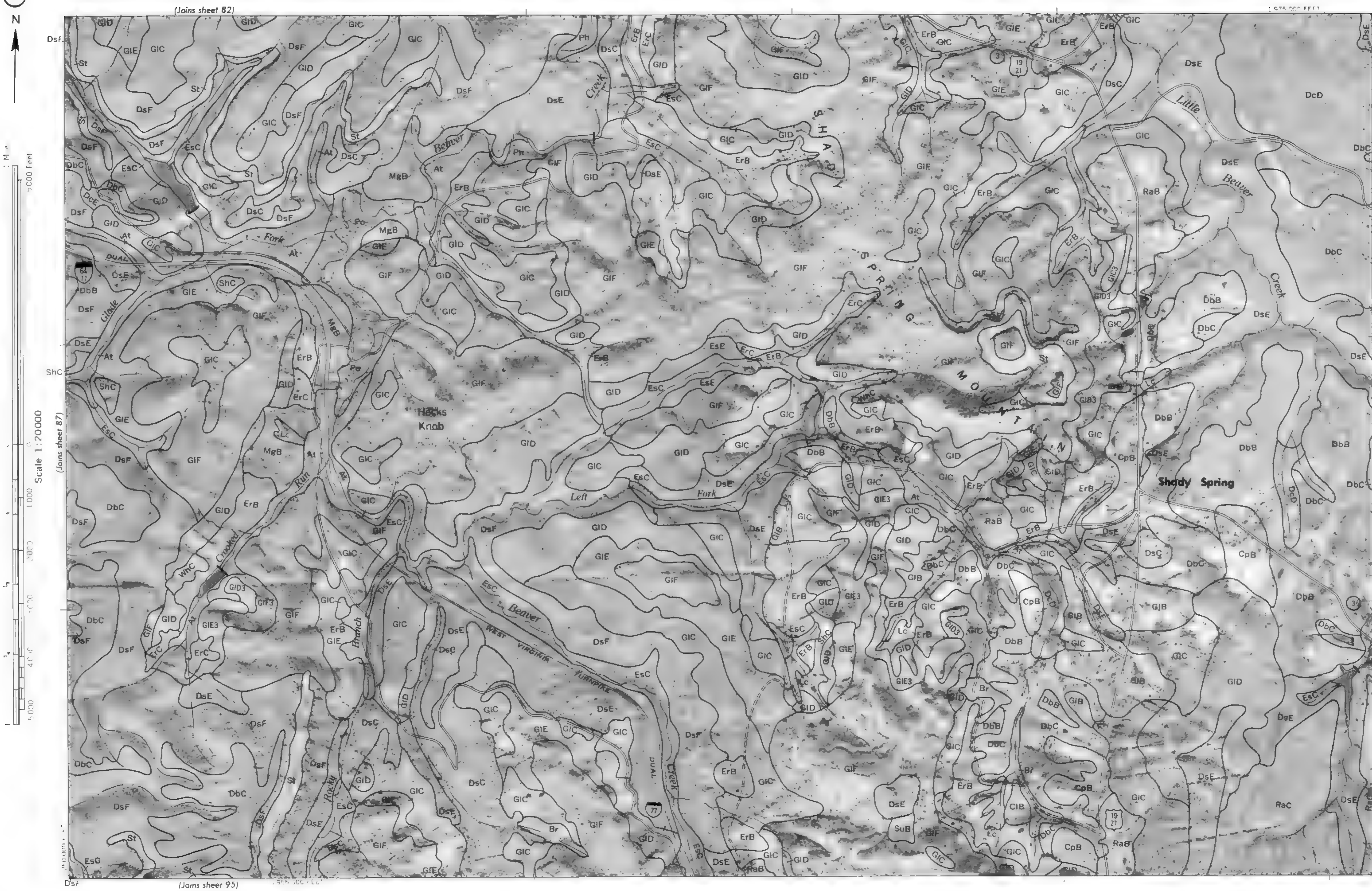
This map is one of a set compiled in 197_ as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.


85
N
(Joins sheet 79)
1 880 000 FEET
GUYANDOTTE MOUNTAIN
WYOMING COUNTY
Laurel Fork
Buck Fork
Grassy Fork
Burnt Fork
Richardson Branch
(Joins sheet 86)
(Joins sheet 92)
1 900 000 FEET
(Joins sheet 97)
1 901 000 FEET
3000 AND 5000-FOOT GRID TICKS
Scale 1:20000
1 Mile
5000 Feet
1000
2000
3000
4000
5000
MnF
MkF
MkE
MkD
MkC
EsE
ShD
ShC
ErC
ErB
Ph
Me
St

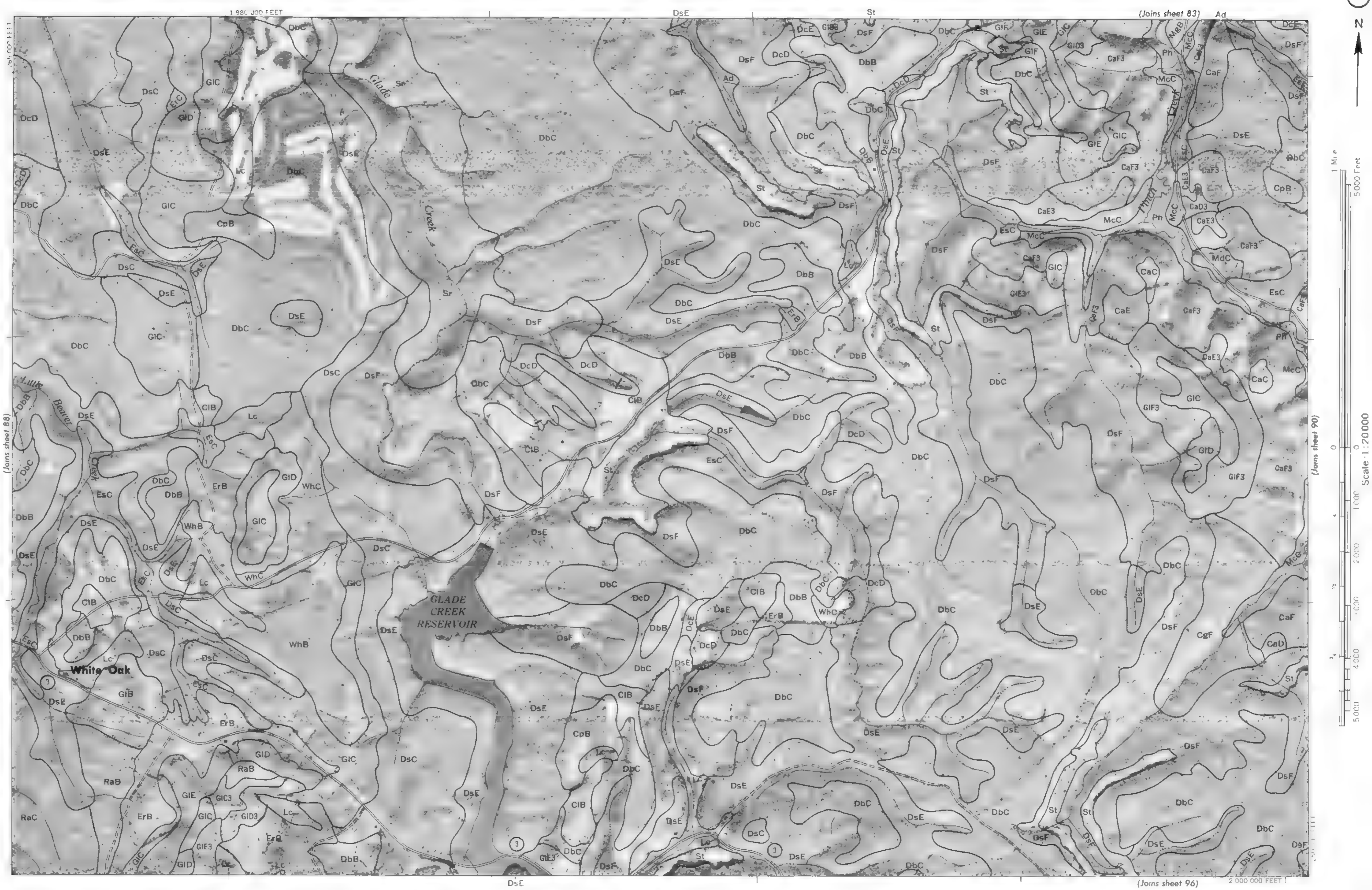


86
N
(Joins sheet 80)
(Joins sheet 85)
(Joins sheet 87)
(Joins sheet 93)
Scale 1:20000
Lester
Glen White
Sophia
Slab Fork
Big Stick
Skinner Fork
Shockley Branch
Crab Orchard Cr
Low Gap Branch
Soak Creek
Winding Gulf
Alderson Branch
Old Shop Br
Slab Fork
SLAB FORK CEMETERY
NORFOLK AND WESTERN
TUNNEL
GUYANDOTTE MOUNTAIN
ACCORD RIDGE


87
(Joins sheet 81)
(Joins sheet 86)
(Joins sheet 88)
(Joins sheet 94)
N
Scale 1:20000
5000 Feet
Pemberton
Midway
Sophia
Sullivan
GUYANDOTTE MOUNTAIN
STANTON GRIFFITH RIDGE
WEST VIRGINIA TURNPIKE
NORFOLK AND WESTERN
Turkey Branch
Piney Creek
Soak Creek
Laurel Branch
Winding Gulf
Glade Fork
Take in Creek
TUNNEL

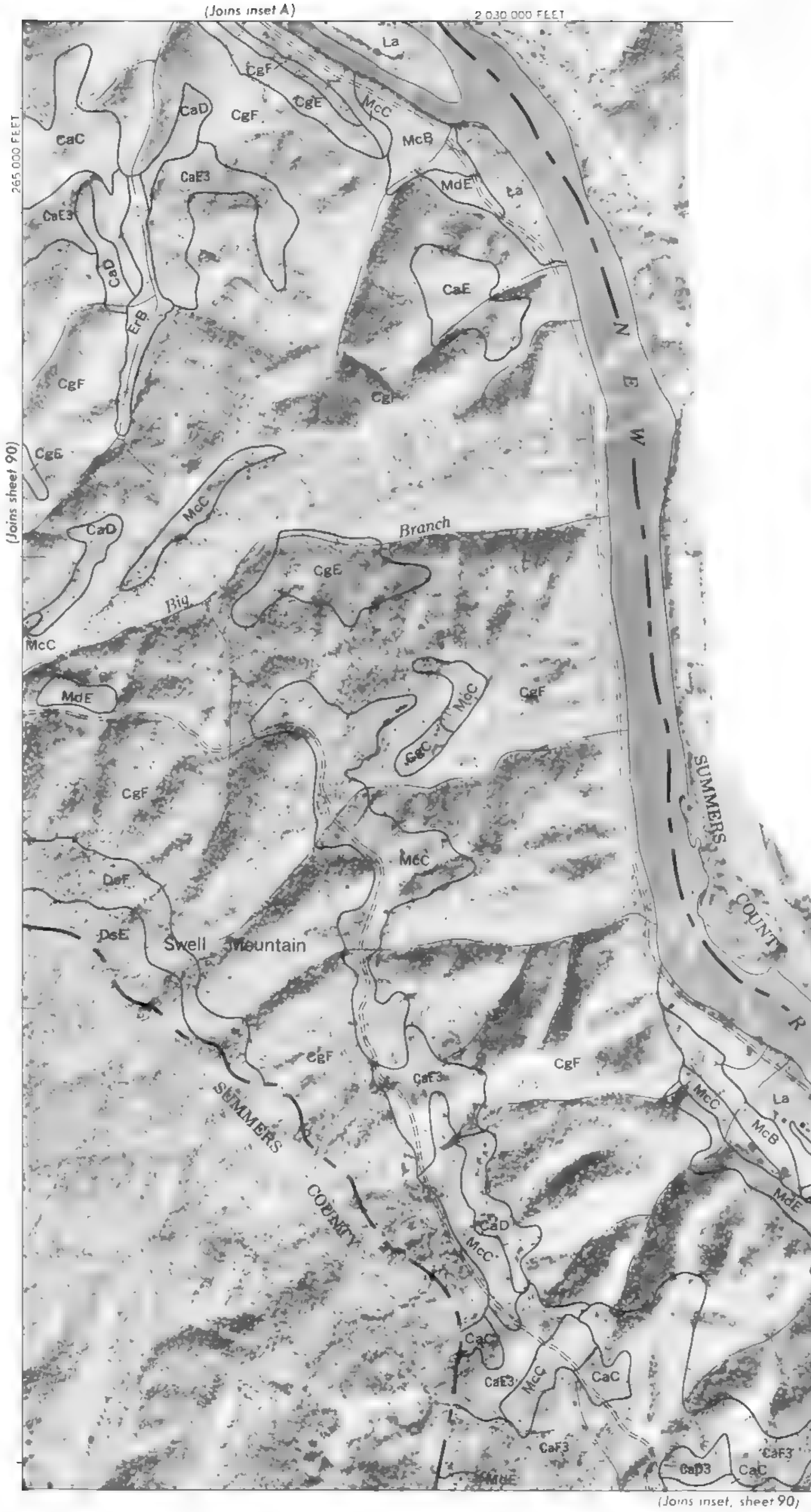


Photobase from 1957, 1958 and 1961 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

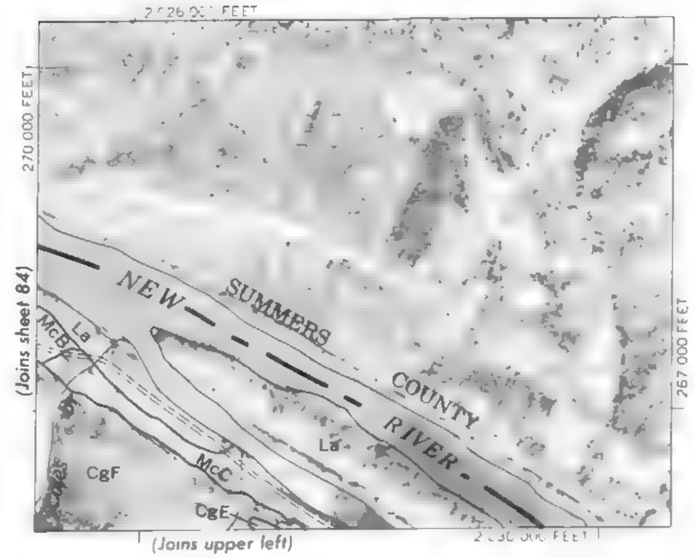

89
N
(Joins sheet 83)
(Joins sheet 88)
(Joins sheet 90)
(Joins sheet 96)
1 980 000 FEET
2 000 000 FEET
Scale 1:20000
1 Mile
5000 Feet
GLADE CREEK RESERVOIR
White Oak
Glade Creek
Little Beaver Creek
Pinch Creek
DsE
St
Ad
DbC
DsF
DcD
DbB
DsC
GlC
GlD
DcD
CpB
EsC
ClB
Lc
WhC
WhB
ErB
GlB
RaB
RaC
GlE
DsE
CaF3
CaE3
McC
Ph
CaC
CaE
CaF
CgF
GlF3
GlE3
MdC
CaD


N
(Joins sheet 84)
(Joins sheet 89)
(Joins sheet 91)
GIF (Joins inset, sheet 96)
Scale 1:20000
1 Mile
5000 Feet
2 025 000 FEET
265 000 FEET
250 000 FEET
WHITE OAK MOUNTAIN
SUMMERS COUNTY
Pluto
Pinch
Creek
Mill
Coles
Branch
Big
Br
(Joins sheet 91) 2 035 000 FEET
NEW RIVER
SUMMERS COUNTY
249 000 FEET
245 000 FEET
2 030 000 FEET
4000 AND 5000 FOOT GRID TICKS

91



INSET A

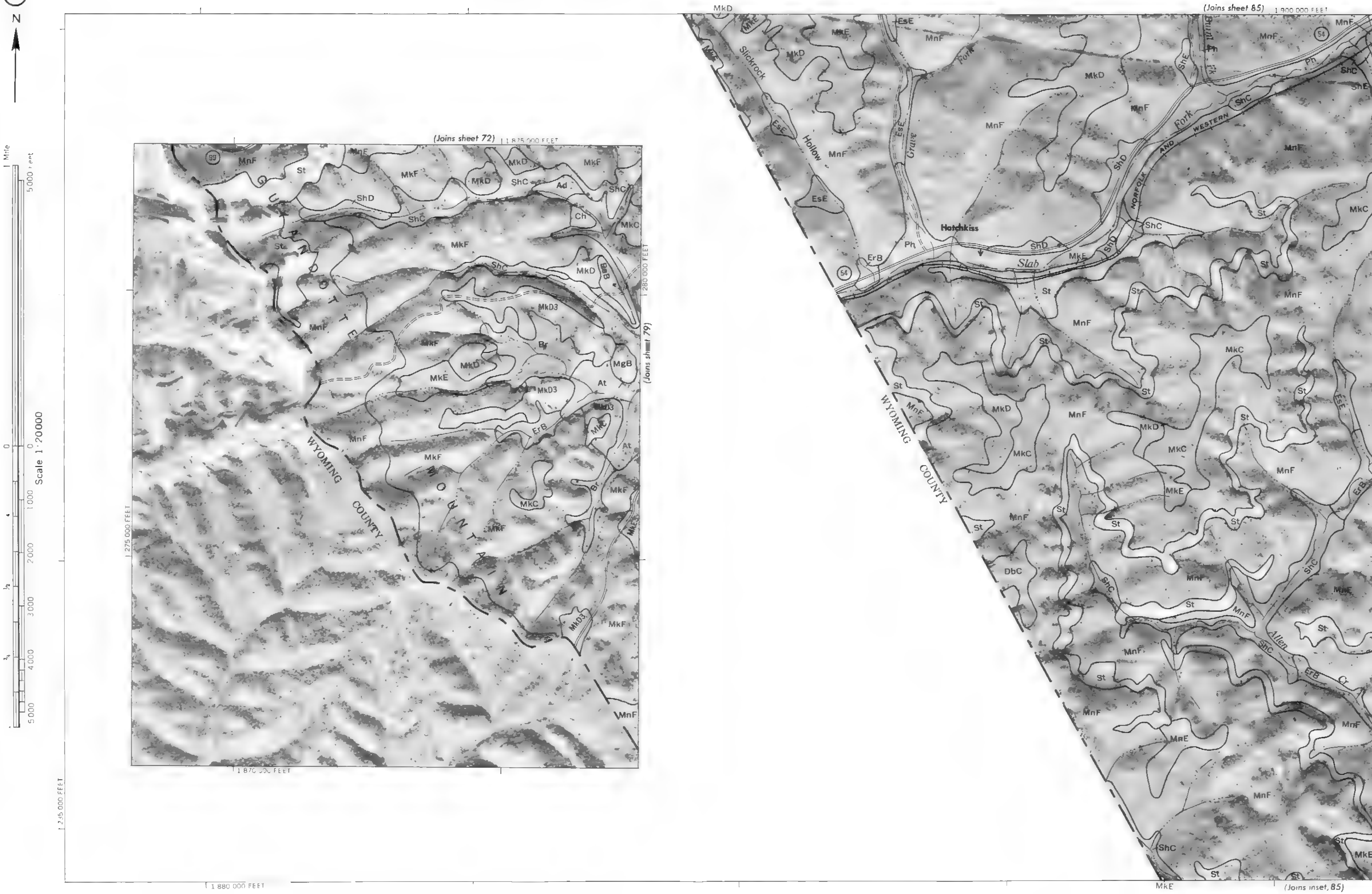


3000 AND 4000 FOOT GRID TICKS

INSET B

250 000 FEET

2 045 000 FEET

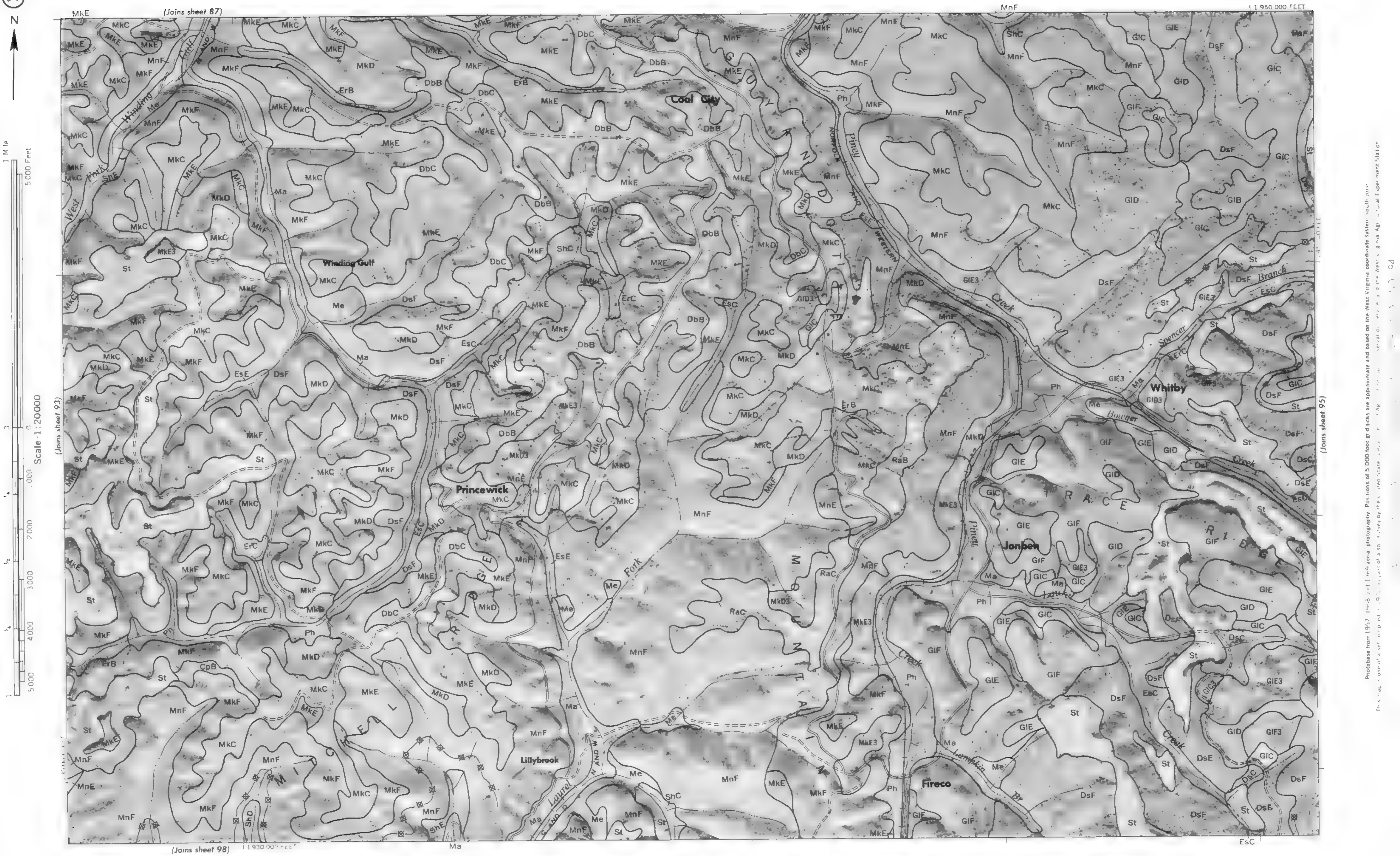

92
N
Scale 1:20000
1 Mile
5000 Feet
(Joins sheet 72)
1 875 000 FEET
(Joins sheet 79)
280 000 FEET
275 000 FEET
1 870 000 FEET
(Joins sheet 85)
1 900 000 FEET
250 000 FEET
(Joins sheet 93)
(Joins inset, 85)
1 880 000 FEET
245 000 FEET
GUYANDOTTE MOUNTAIN
WYOMING COUNTY
Hotchkiss
Slab Fork
NORFOLK AND WESTERN
Slickrock Hollow
Grave Fork
Allen Cr
Bragg Fk
MnF
MkF
MkD
MkD3
MkE
MkC
ShC
ShD
ShE
St
Ad
Ch
At
Br
ErB
EsE
MgB
DbC
Ph
54
99

N

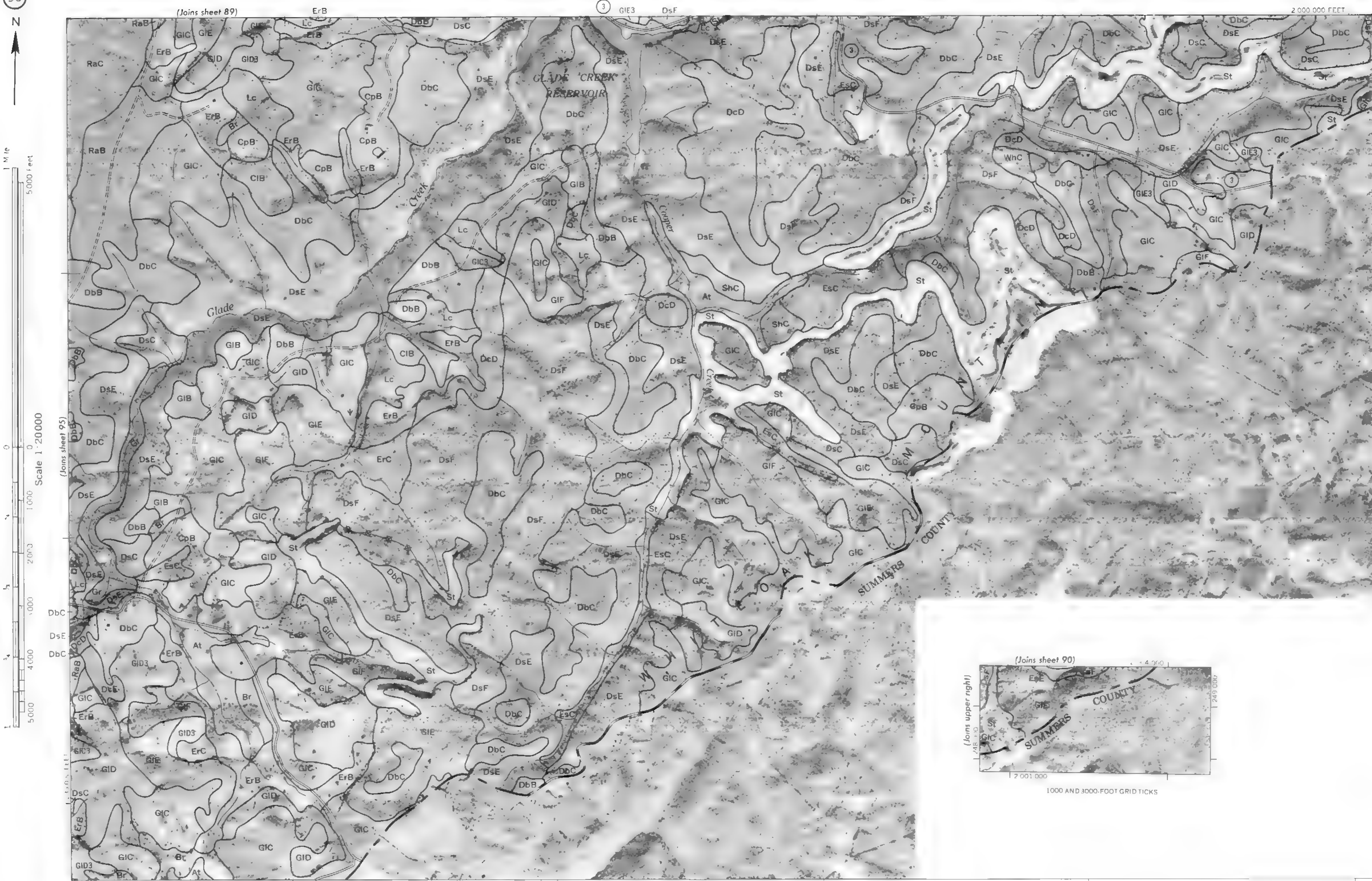
Scale 1:20000

1 Mile

5000 Feet


94
N
(Joins sheet 87)
(Joins sheet 93)
(Joins sheet 95)
(Joins sheet 98)
Scale 1:20000
1 Mile
5000 Feet
Coal City
Winding Gulf
Princewick
Lillybrook
Whitby
Jonben
Fireco
West Fork
Winding Gulf
Piney Creek
Spencer Branch
Laurel Fork
Lambkin Br
GUYANDOT MOUNTAIN
MITCHELL RIDGE
RACE RIDGE
NORFOLK AND WESTERN

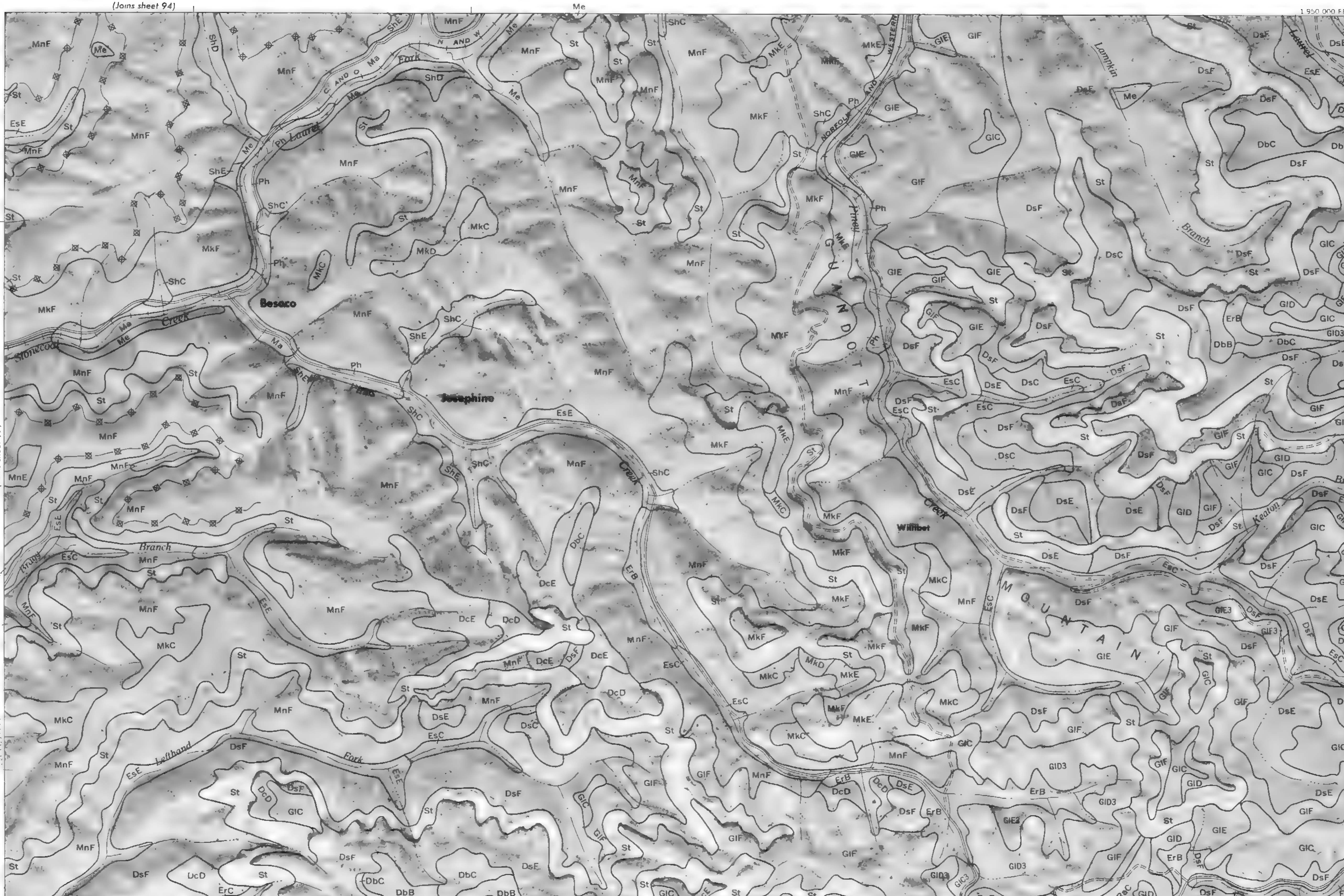
(Joins sheet 88)
(Joins sheet 94)
(Joins sheet 96)
(Joins sheet 99)
1 955 000 FEET
1 975 000 FEET
N
Scale 1:20000
1 Mile
5000 Feet
STANTON GRIFFITH RIDGE
Cool Ridge
Glade Creek
Cherry Creek
Beaver Creek
WEST VIRGINIA TURNPIKE
77
19 21
DUAL


96
N
(Joins sheet 89)
(Joins sheet 95)
(Joins inset)
(Joins inset, sheet 103)
2 000 000 FEET
1 980 000 FEET
GLADE CREEK RESERVOIR
Glade
Creek
Cooper
Creek
SUMMERS COUNTY
Scale 1:20000
1 Mile
5000 Feet
(Joins sheet 90)
(Joins upper right)
2 001 000
1000 AND 3000-FOOT GRID TICKS


(Joins sheet 93)
(Joins sheet 98)
(Joins sheet 100)
(Joins inset, sheet 85)
N
Scale 1:20000
1 Mile
5000 Feet
1 925 000 FEET
Helen
East Gulf
Killarney
Mead
Rhodell
Stone Coal
HORSE RIDGE
TOMMY RIDGE
WYOMING COUNTY
Berry Branch
Farley Branch
Allen Creek
Gulf
Winding Gulf
Stonecoal Creek
Stonecoal
Tommy Creek
Bragg Branch
Rhodell Creek
NORFOLK AND WESTERN
CHESAPEAKE AND OHIO
N AND W
16
MnF
MkF
MkE
MkC
MkD
Me
Ma
Ph
Ch
St
ShC
ShD
ShE
EsC
EsE
ErB
ErC
MnE
DbC
MkG

N

(Joins sheet 94)



1 Mile

5000 Feet

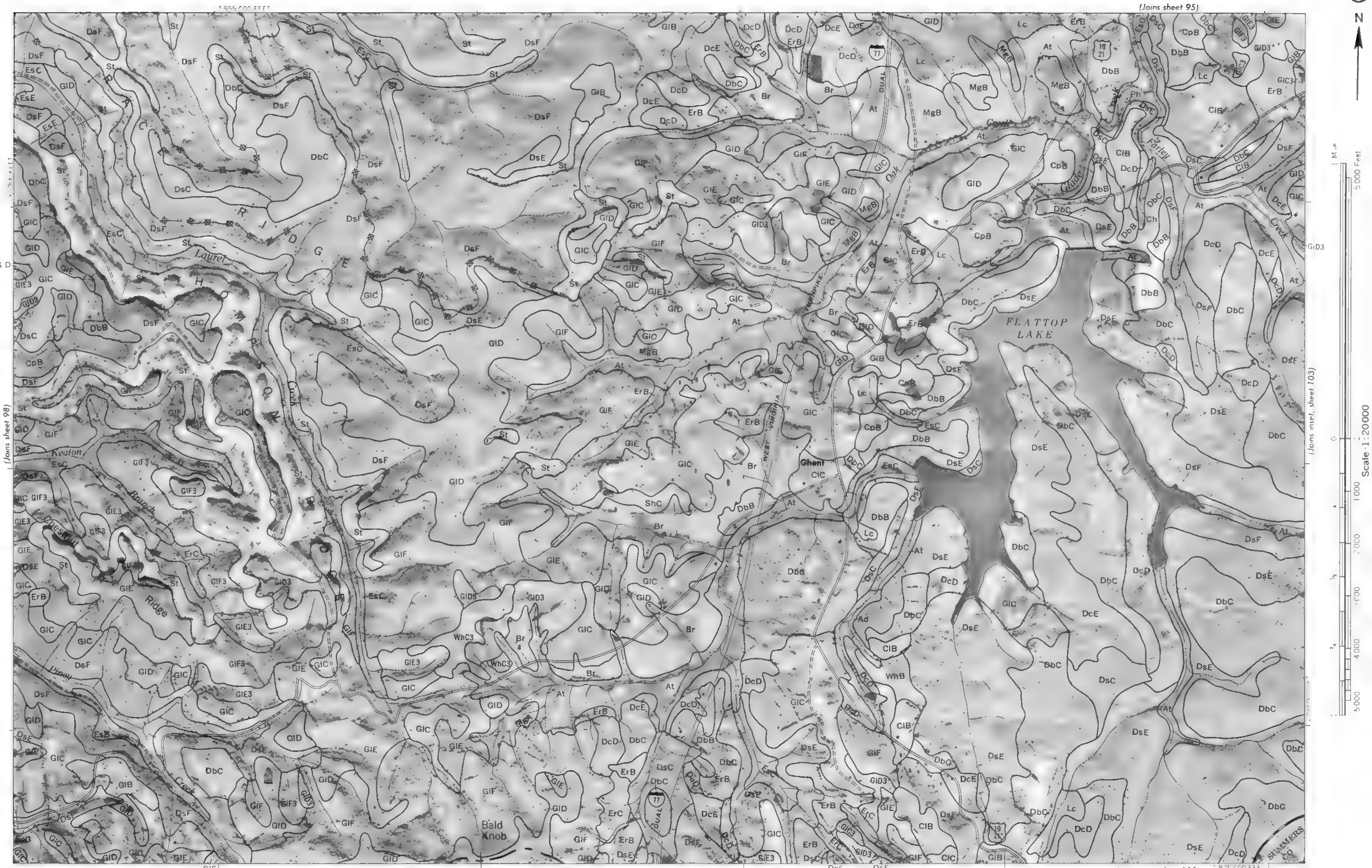
Scale 1:20000

0 1000 2000 3000 4000 5000

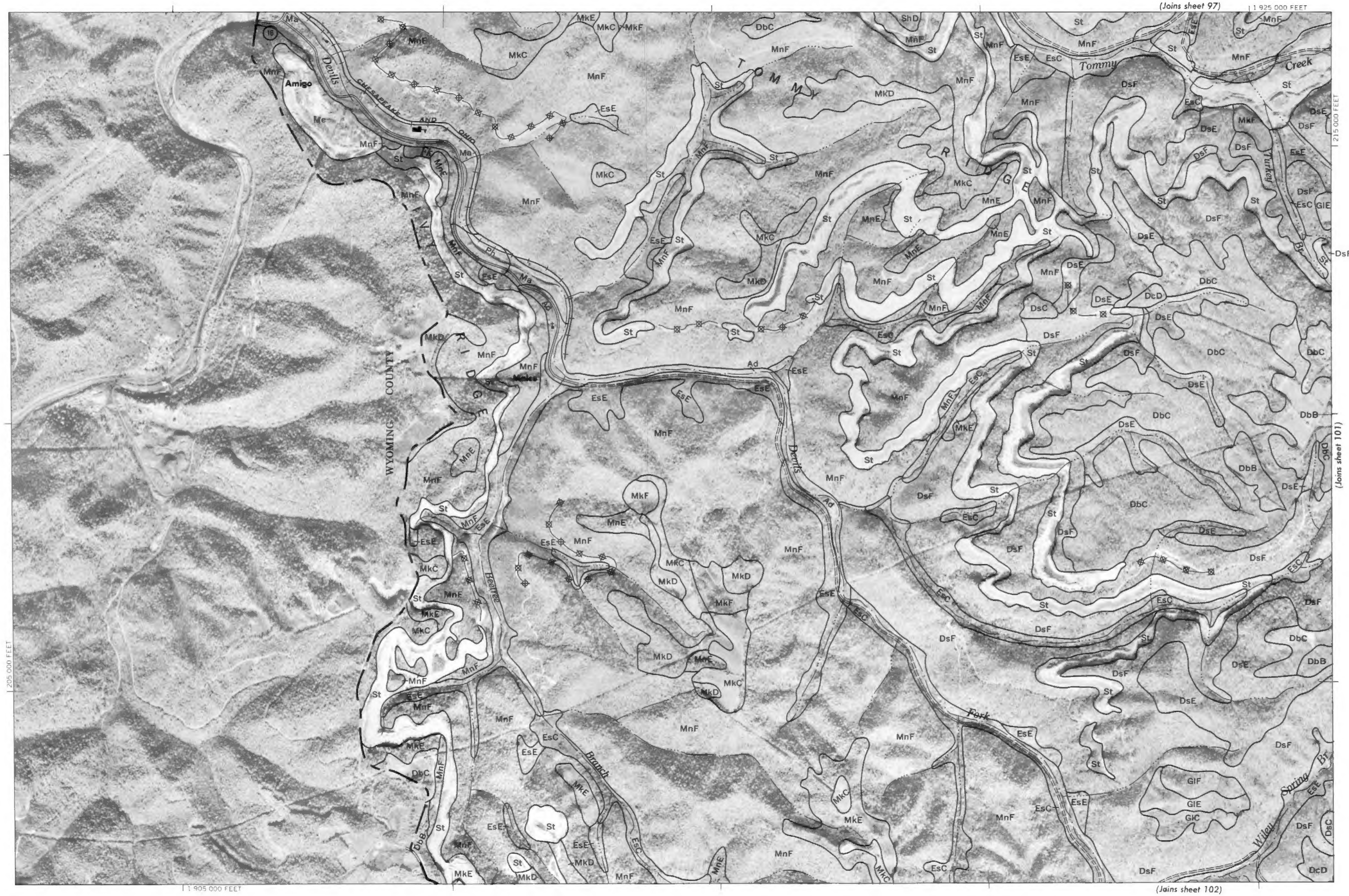
Photobase from 1957 1958 and ... aerial photography. Positions of 5 000 foot grid ticks are approximate and based on the West Virginia coordinate system south zone.

This map is one of a set compiled in 19.. as part of a soil survey by the United States Department of Agriculture ... and the West Virginia Agricultural Experiment Station

99


(Joins sheet 95)
(Joins sheet 98)
(Joins inset, sheet 103)
(Joins inset, sheet 102)
N
Scale 1:20000
FLATTOP LAKE
Ghent
Bald Knob
Laurel Creek
Glade Creek
Keaton Branch
Piney Creek
Ridge
WEST VIRGINIA TURNPIKE
DUAL
SUMMERS CO

N



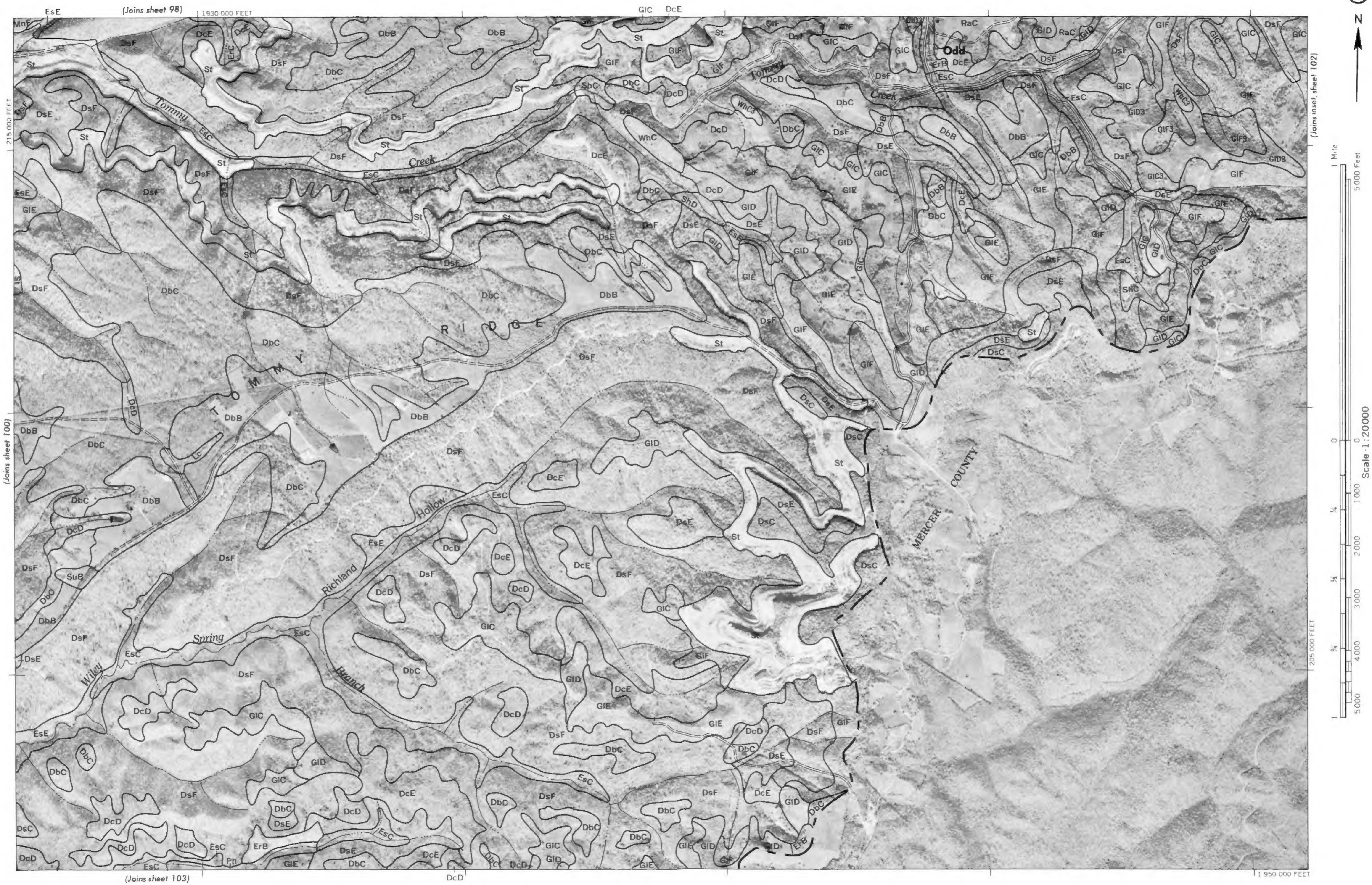
1 Mile — 5000 Feet

Scale 1:20000

0 — 1000 — 2000 — 3000 — 4000 — 5000

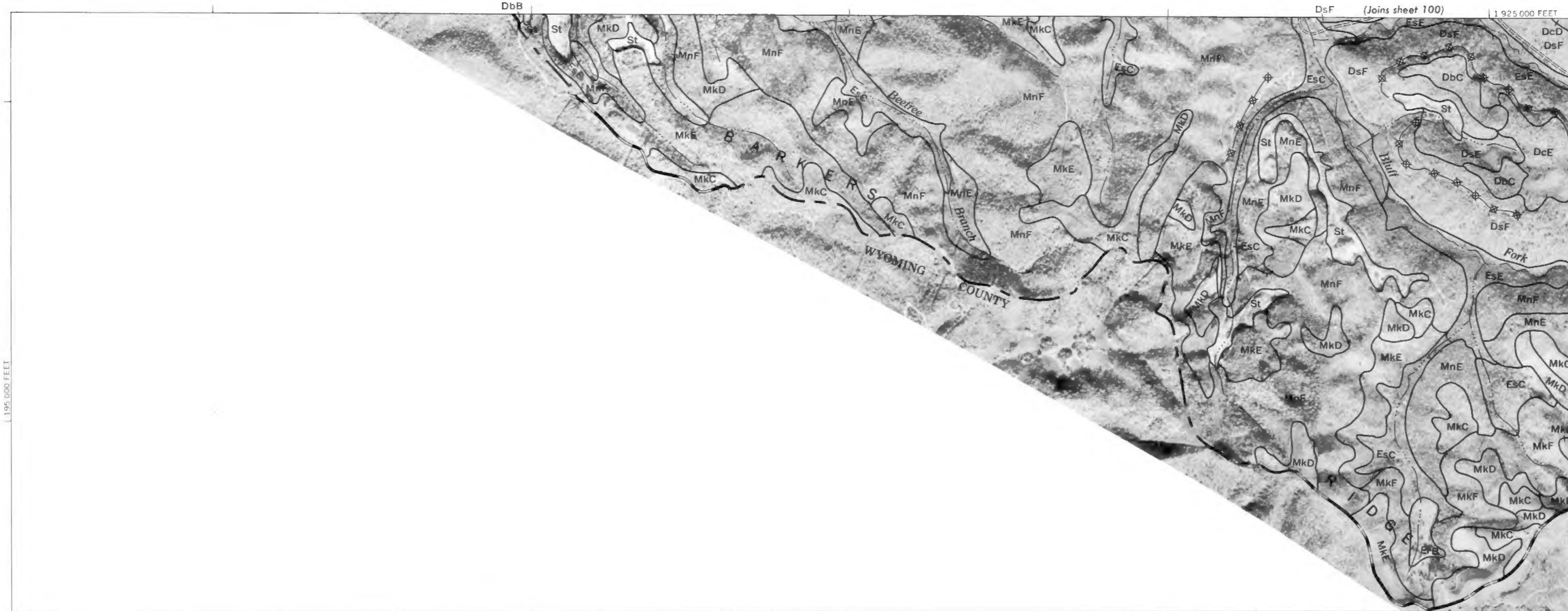
Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958, and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.

N

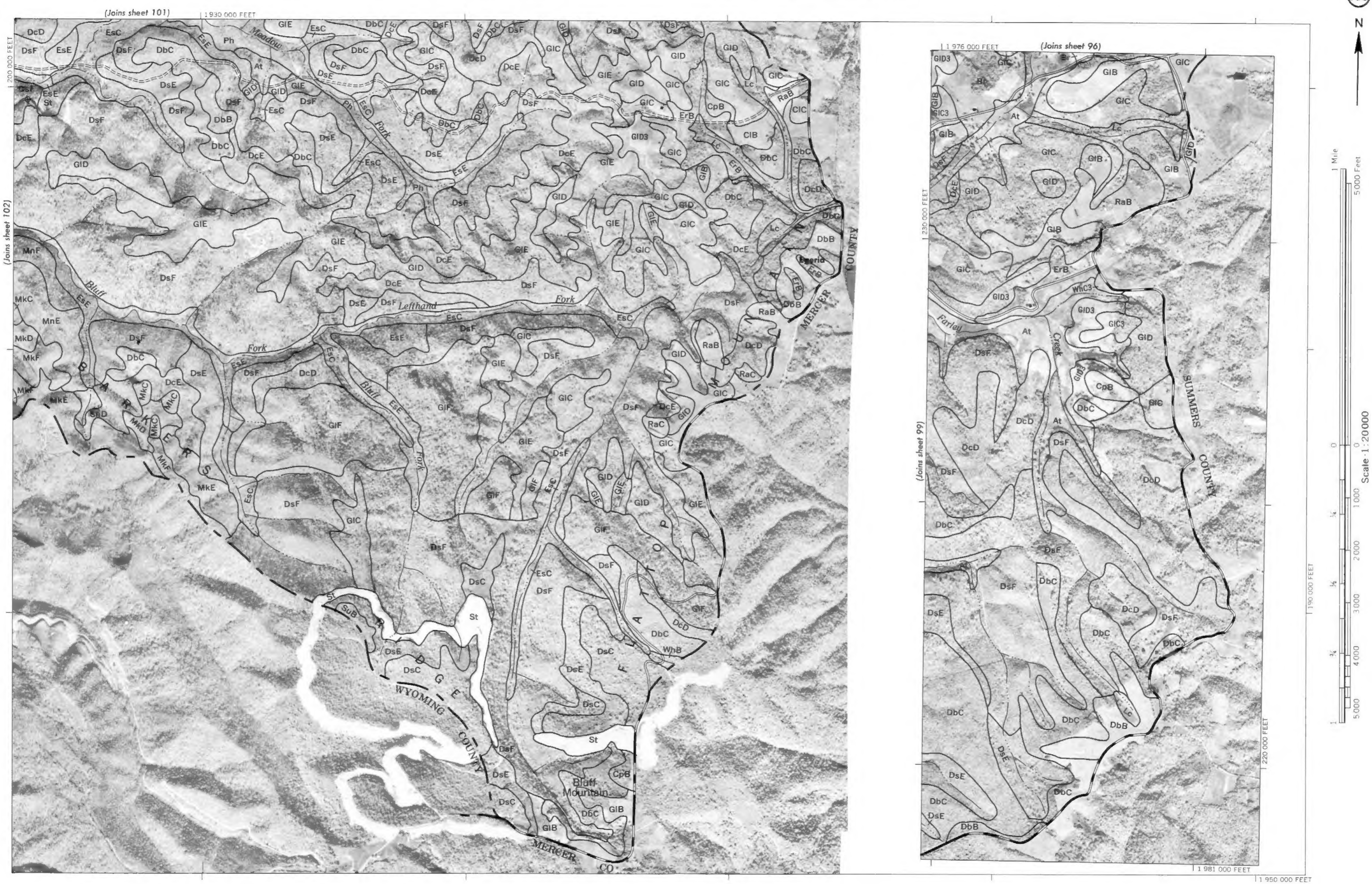


1 Mile
5000 Feet
Scale 1:20000
0 1000 2000 3000 4000 5000
0 ¼ ½ ¾ 1

4000 AND 5000-FOOT GRID TICKS

Photobase from 1957, 1958 and 1969 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.

FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 102



FAYETTE AND RALEIGH COUNTIES, WEST VIRGINIA NO. 103

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the West Virginia Agricultural Experiment Station.
Photobase from 1957, 1958, and 1959 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the West Virginia coordinate system, south zone.